AUTOMOTIVE INDUSTRIES

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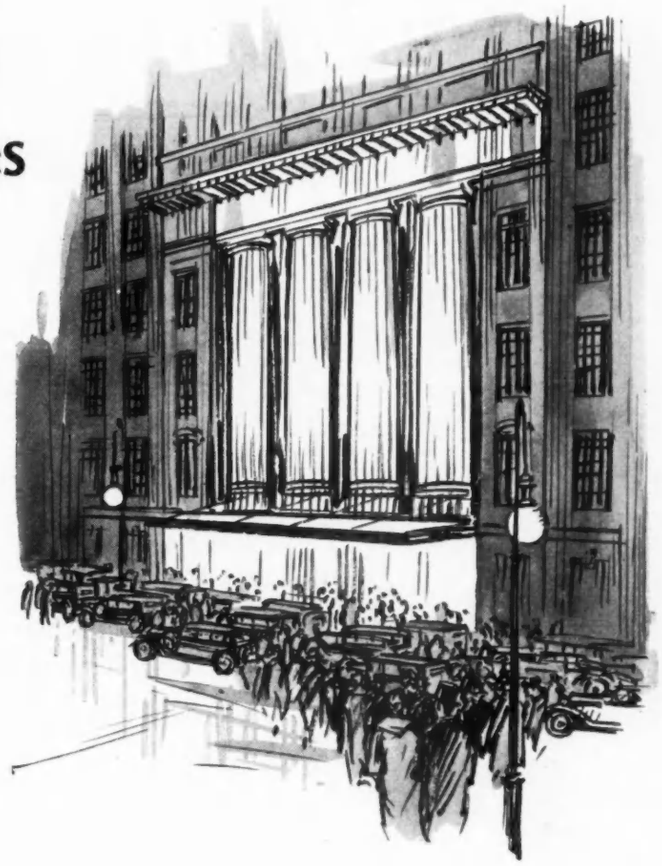
Without Magic

Gaining Confidence—Undismayed

The Industry Moves Forward

by Leslie Peat



A BATTERED industry will smile its confidence in the new year when the doors of Grand Palace open upon what will probably be the most brilliant offering of striking automotive developments ever gathered under one roof.

Thwarted by the financial debacle of 1929, disheartened by the progressively lean months of 1930 and stunned by the world-wide pessimism of the past year, the motor car industry will have risen to a flood of high achievement as the show season officially opens, on Jan. 9 in New York City and on the 30th of the month in Chicago.

Whatever is for sale must be gaged in large measure by the larger economic picture of world commerce. Some industrial leaders in other fields discuss the automotive industry in awed tones, attributing to it something of magic and expecting that when this industry "gets going right" it will carry all manufacturing, commerce and finance to new highs. This is fallacious, of course. Unless that mystery be greater confidence—except insofar as the automotive industry may have a larger amount of driving faith in the future—it has nothing that other industries lack.

The automobile business was created in wagon works, carriage factories and machine shops by men of faith. It became one of the world's greatest agencies in providing individual transportation to people on every part of the globe. It pierced dark interiors, it mastered ancient barriers, it built great suburban cities and communities in every nation. And this was its second achievement through faith, because it did so in spite of every conceivable obstacle. Faith in the future of the industry led its phalanx of salesmen into regions almost unexplored by geographers. Faith in its development drove engineers to radical, brilliant designing for greater convenience, and utility.

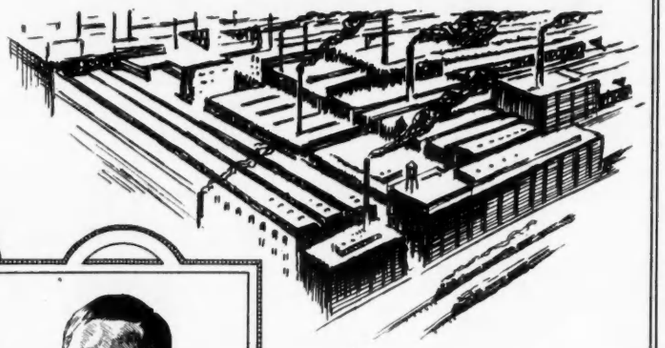
The dawn of 1932 will break upon the greatest demonstration of faith the industry has yet shown. Not only in the new models, embracing as they will greater strides in design as well as an heroic outlay of capital, but in the organizations that comprise the business, will the world see a stronger, braver industry rise from the wreckage of the past two years.

Management has taken a stronger hold upon its functions during this dark period. Once again, as during the formative days of the industry, management itself has been working out its own problems instead of delegating that function to subordinates. A number of top executives have confessed their amazement in discovering how little they really knew of management during those fat years which preceded the lean ones.

This firmer grip, this more intelligent insight into the workings of the industry, must compel the world to renew its faith in the industry.

Widespread Activities of the Studebaker Corporation

Albert Russell Erskine



H.S.Vance

The Studebaker Corporation
South Bend, Ind.
Manufacturing and Holding Company
Albert Russell Erskine, *Pres.*
H.S.Vance, *Vice-Pres.*
Paul G.Hoffman, *Vice-Pres.*
Organized in 1911, taking over Studebaker Bros. Mfg. Co. of Detroit and South Bend.

Paul G.Hoffman

1931

Studebaker Sales Corp. of America
P.G.Hoffman
President
South Bend
Org. 1931

Pierce-Arrow Motor Car Co.
A.R.Erskine
President
A.J.Chanter
1st *V.P. Gen.Mgr.*
Buffalo N.Y.
Acquired Control 1928

Rockne Motors Corporation.
H.S.Vance
President
Geo.M.Graham
Vice-Pres.
Detroit
Org. 1931

S.P.A Truck Corporation
J.M.Cleary
President
South Bend
Org. 1930

Studebaker Pierce-Arrow Export Corp.
P.G.Hoffman
President
A.L.Frank
V.P. Gen.Mgr.
South Bend
Org. 1929

S.P.A.R. Sales Company
Paul G.Hoffman
President
E.C.Mendler
Vice-Pres.
South Bend
Org. 1931

Studebaker Corp. of Canada, Ltd.
Walkerville, Ont.
P.G.Hoffman
President
D.R.Grossman
V.P. Gen.Mgr.
Org. [illegible] 1909

Pierce-Arrow Co. of Canada Ltd
P.G.Hoffman
President
D.R.Grossman
V.P. Gen.Mgr.
Org. 1931

Free Wheeling Patents Corp.
H.S.Vance
President
South Bend
Org. 1930

Citizens Home Company
A.G.Rumpf
President
South Bend
Org. 1919

Studebaker's Recent Growth Places Corporation Among Automotive Giants

Formation of Rockne Motors Corp., S.P.A.R. Sales Co., and other subsidiaries gives South Bend organization wide coverage of fundamental motor-vehicle markets

by Norman G. Shidle

ANOTHER giant, sturdy with years and copiously equipped with the sinews of production, engineering and financial war is emerging, threatening to battle on even terms for automotive supremacy with General Motors, Chrysler and Ford, now the three largest of the automotive Titans, measured in terms of total assets.

Studebaker Corp., with the recent formation of Rockne Motors Corp., and S.P.A.R. Sales Co., has served notice of its intent to move into the fight for leadership at every point on the competitive front. Little by little, the South Bend corporation has increased its lines, the number of companies under its control and the scope of its organization. So gradually has the process taken place over a period of several years that even close observers scarcely realize how widespread has become the Studebaker challenge. All of the facts shown in the accompanying chart are known to the industry—as individual facts—but viewing them in array in a single show window tempts one to conjure up new visions of their possible significance. While the corporation has grown steadily in size and power since the beginning of A. R. Erskine's administration in 1911, the fullest broadening of its scope and its activities has been written into the history of the last five years.

At the end of two years of serious depression for the whole industry, Studebaker showed total assets in Sept., 1931 of $112,630,209, placing it behind only General Motors, Chrysler and Ford in this respect. Chrysler at that same time had assets totalling $781,-021,845 while General Motors showed its total assets as $1,328,381,170. Ford had total assets of $781,-964,571 at the beginning of 1931.

Conservative Dividends Strengthened Position

Radical reduction in the dividend rate by Studebaker within the past twenty-four months, has, in the opinion of some analysts, materially improved the corporation's position from a purely competitive standpoint, rendering possible many competitive moves in pricing and engineering development which might have been made only with considerable hesitation had higher dividend rates still been beckoning the dollars hard-wrung from diminishing sales totals.

To pay its dividend of seven per cent on the 64,000 shares of outstanding preferred stock, $448,000 are required. To pay its current dividend of $1.20 a year on its 1,905,045 outstanding shares of common stock, $2,286,054 are required, while $429,000 is needed to care for the 71,500 shares of 6 per cent Pierce-Arrow preferred. This makes total dividend requirements of $3,163,054 a year.

In nine months of 1931, the worst year the industry has known in many respects, Studebaker Corp. earnings, including Pierce-Arrow, were $2,496,126. While final figures for the year may show total earnings slightly lower than this figure, there is every indication that dividend requirements next year will be met rather easily whether a marked upturn in general business conditions takes place or not.

Built on a Strong Foundation

The beginnings of this company, reaching far back into the roots of automotive history, are generally well known to the veterans of the industry. There in that gradually fading picture of a virile long ago one recalls the incorporation of the Studebaker Bros. Manufacturing Co. in 1868 for the manufacture of carriages and wagons, an outgrowth of the old blacksmith shop originally opened in South Bend in 1852 by H. and C. Studebaker, sons of John Studebaker. Old timers in the industry still alive recall clearly how this highly-reputed carriage making company first entered the automobile business in 1903, manufacturing an electric vehicle—and that a year later a gasoline car was brought out.

Then in 1908, the pages of automotive history record, Studebaker contracted with the Everitt-Metzger-Flanders Co. of Detroit, to market the entire output of E-M-F cars, later augmented by the Flanders 20. A year later, in 1909, control of E-M-F was obtained by Studebaker. A merger was effected in 1910 and a year later the corporate name became The Studebaker Corp., the E-M-F company losing its identity entirely.

While Studebaker was selling E-M-F's, it was also handling the sale of the Garford during the years of 1909 and 1910. Later Garford handled its own sales, only to make an agency arrangement with Willys-Overland some years later.

Both E-M-F and Flanders 20 were merchandised as

such by Studebaker in 1912 after the merger was effected, but toward the end of that year, the Studebaker name was placed on all the vehicles manufactured by the company.

In the branches of Studebaker history were many notable connections which do not appear in the ordinary genealogy. The Everitt-Metzger-Flanders Co., which played so important a part in Studebaker merchandising 20 years ago, was formed in 1908 by purchase of the Wayne Automobile Co. of Detroit and the Northern Automobile Co. of Detroit and Port Huron, both well-known companies in their day. Wayne began to produce in 1904 and Northern in 1903. E-M-F purchased the DeLuxe Motor Car Co. of Detroit in 1909, which organization had sprung from the C. H. Blomstrom Motor Co., also of Detroit, which manufactured the Queen car from 1903 until absorption by DeLuxe in 1906.

Studebaker Name Used Since 1911

But with the formation of the Studebaker Corp. and the coming of A. R. Erskine as president in 1911, all these tangled webs of the past began to grow as a firmly knit consolidated entity. From 1911 until 1928, every vehicle manufactured by the corporation or its subsidiaries bore the name Studebaker with the single exception of the Erskine which ran a brief course during the years 1927 and 1928. This was the period, one might say, in retrospect, of consolidation of facilities and organization, of building of firm financial foundations necessary to first rank leadership in modern competition and development of an organization and a personnel capable of sound future expansion to meet later new requirements.

Beginning with the purchase of a controlling interest in Pierce-Arrow Motor Car Co. in 1929, another new era began in Studebaker policy; at least, subsequent events would indicate that it did.

Control of Pierce-Arrow was acquired through the P.A.S. Motor Corp., which issued its entire capital stock (175 shares) to Studebaker for $2,000,000 in cash. The 175 shares of P.A.S. Motor Corp. stock were subsequently exchanged for 230,125 no par Class B shares (which constituted the entire issue) of the Pierce-Arrow Motor Car Co.

During 1929, Studebaker Corp. acquired 129,014 shares of Pierce-Arrow Class A stock by purchasing 103,700 shares in the open market at a cost of $3,335,575 and by exchanging Studebaker common, under the offer of June 19, 1929 for 25,314 shares. Then in 1930, Studebaker bought 15,400 shares of Pierce-Arrow Class A stock on the open market. This ownership of Class A stock, together with the Class B stock purchased in 1928, gave Studebaker at the end of 1930 an interest of more than 90 per cent in Piece-Arrow profits, after providing for dividends on P-A six per cent preferred stock. Class B is the voting stock. In addition to these common stock holdings, 13,000 of Pierce-Arrow preferred have recently been bought by Studebaker for investment purposes.

In the few years since the Pierce-Arrow purchase, new subsidiaries, designed for specific purposes and specially equipped to perform definite functions have come with some rapidity. Feb. 7, 1929 marked the incorporation of the Studebaker-Pierce-Arrow Export Corp. with authorized capital stock of 5,000, $100 par value shares. Having handled exports of all Studebaker and Pierce-Arrow cars and trucks since the formation, this unit will now control foreign sales of Rockne as well.

Studebaker Corp. of Canada, Ltd., while organized in 1909, has undergone marked development in recent years. It is located at Walkerville, Ontario, and has just incorporated as a subsidiary the Pierce-Arrow Co. of Canada, Ltd. In 1932, the Studebaker Canadian plants will manufacturer Rockne cars and delivery trucks, Pierce-Arrow cars and trucks as well as the Studebaker line of vehicles.

In 1930 came the consolidation of Studebaker controlled truck interests under the guidance of a single unit, the S.P.A. Truck Corp. Since the organization of this company, Studebaker has gone from eighteenth to sixth place in truck sales and has put into the field a complete line of commercial vehicles.

Following its pioneering of free wheeling in the fall of 1930, the Studebaker Corp. formed, together with the Borg-Warner Corp., the Free Wheeling Patents Corp. to take over under agreement the free wheeling patents and applications owned by these two organizations. The patents are said to furnish broad coverage of free wheeling under positive gear control and Borg-Warner has exclusive license as parts manufacturers to manufacture free-wheeling transmissions under these patents. Studebaker Corp. owns 51 per cent and Borg-Warner Corp. 49 per cent of the stock of the Free Wheeling Patents Corp.

Citizens' Home Co. is a completely owned subsidiary formed by Studebaker Corp. to properly care for employee housing in South Bend.

Somewhat dimmed by the fanfare of the new Rockne announcement so far as immediate general trade interest is concerned, the recently formed S.P.A.R. Sales Co., set up to merchandise replacement parts and accessories for *all* Studebaker Corp. subsidiaries, is a definite step in parts marketing second in interest to no recent development in this field.

While not the first separate parts selling company to be formed by a car manufacturer—Chrysler Motor Parts Corp. having been in existence for some time—this new Studebaker subsidiary will carry out a number of policies which a short three years ago would have been considered revolutionary by almost any passenger car or truck maker. Based on the fundamental thought that the car manufacturer can get back replacement parts business heretofore lost to independent parts makers only by competing with those independents in price, service and availability, the S.P.A.R. organization appears to have foregone the idea that all replacement parts business belongs to vehicle manufacturers simply by divine right.

S.P.A.R. Parts Organization

A separate article will be necessary in order to describe in detail the various phases of S.P.A.R. policy and procedure which will be of interest to every executive having to do even remotely with replacement parts distribution in any way. It can be stated briefly, however, that the new company will distribute through a series of 15 warehouses, that specific list prices will be established on each part, each part being priced to dealers and distributors on a definite net-price basis. These net-prices will represent the equivalent of discounts ranging from 25 per cent to 60 per cent. Independent repair shops as well as car dealers can have parts delivered from any one of these warehouses provided the sanction of the local Studebaker dealer has been obtained. Dealers contract to sell

parts to independent repair shops at substantial discount from list prices. Paul G. Hoffman is president and E. C. Mendler vice-president and general manager of the S.P.A.R. Co.

Now in 1931, with the incorporation of Rockne Motors Corp. on Nov. 2, realignment of its former subsidiary, Studebaker Corp. of America, into Studebaker Sales Corp. of America and formation of the S.P.A.R. Sales Co., the Studebaker Corp. seems almost to have completed its planning, finished its regimentation of men and companies.

If Dec., 1931 is a zero hour in the automotive industry—as many believe it is— then Studebaker would seem to be ready to go over the top and to join battle in every department with the other giants of industry.

Studebaker Set to Go

Bankers and economists, of course, are prone to study and evaluate organizations and their possibilities largely in terms of financial statements, earnings records and cash reserves. These elements of Studebaker history are not only a matter of record but are too well known and too easily available to bear repeating here. Most of us, however, find considerable interest in the people and personalities involved in any industrial development and tend to place more emphasis on management than on historical financial figures in discussing future trends. The records show that Studebaker stacks up well from either viewpoint.

Its dominating figure, of course, is the financially-trained Albert Russell Erskine, during whose regime its actual position as a modern industrial power has been built. Taking charge of Studebaker Corp. as president in 1911, Mr. Erskine's outstanding achievement, perhaps, has been his practical fusing of fine old traditions with twentieth century action; his speeding up of the industrial tempo, his injection of young minds into the thinking and work of the company without turning back in any way on that which was hardy and splendid in the long past which lay behind the organization at the time he took the reins. Born in Huntsville, Alabama, on Jan. 24, 1871, Mr. Erskine went to work as an office boy when he was 15 years old. A little while later he became a bookkeeper, and at twenty-seven became chief clerk with the American Cotton Co. in St. Louis. Working higher in that organization he later became treasurer of Yale & Towne Mfg. Co., and still later, in 1910, vice-president of the Underwood Typewriter Co. In 1911, at the behest of some banker friends, he assumed the Studebaker presidency.

While Mr. Erskine has very definitely injected several younger men into places of wide and complete responsibility as part of his development and stabilization program, he has himself remained a dominant and active factor in each of the new subsidiaries which he has set up. Thus we find, referring again to the accompanying organization chart for a moment, that Mr. Erskine, in addition to his primary position as president of the Studebaker Corp. (the parent organization), is also president of Pierce-Arrow Motor Co. and chairman of the board of S.P.A. Truck Corp., Rockne Motors Corp., Studebaker Corp. of Canada, Ltd. Until last month Mr. Erskine was also president of Studebaker Corp. of America and of Studebaker Corp. of Canada, Ltd., but with the change in name of the former to Studebaker Sales Corp. of America, he has relinquished these two posts, naming in his place Paul G. Hoffman, one of the triumvirate of younger executives which has gradually been raised to greater responsibilities under Mr. Erskine's leadership.

Mr. Hoffman has in addition been made president of S.P.A.R. Sales Co. and of the Studebaker Pierce-Arrow Export Co., as well as of the recently formed subsidiary of the Canadian company, Pierce-Arrow Motor Car Co. of Canada, Ltd. He is in addition a member of the board of directors of Studebaker Corp., of Pierce-Arrow Motor Car Co., Rockne Motors Corp., Studebaker Sales Corp. of America, S.P.A. Truck Corp. and Studebaker Corp. of Canada, Ltd.

Mr. Hoffman, an enormously successful Studebaker distributor in Los Angeles before he came to South Bend as vice-president in charge of sales of Studebaker Corp. in April, 1925, retains his vice-presidency of the parent corporation under the new setup.

Mr. Hoffman's first important act as president of Studebaker Sales Corp. was the appointment of R. H. Faulkner, recently resigned as Auburn president, to the position of vice-president. (See page 1000.)

Harold S. Vance, another of Studebaker's rising trio, has just been made president of Rockne Motors Corp., thus having added to his other responsibilities the important one of leading to success Studebaker's bid for a place in the low-priced field. Mr. Vance retains his place as vice-president in charge of manufacturing and engineering of Studebaker Corp., which he first assumed in March of 1926. He started with Studebaker as a mechanic apprentice in 1910 and successively occupied positions of minor importance for several years. Before becoming vice-president of manufacturing he had been assistant treasurer, purchasing agent, assistant to the president and sales manager. Now in addition to the two positions of major importance which he fills, he is a director of Pierce-Arrow, of the Studebaker Corp., of the Studebaker Corp. of America, of the Studebaker Corp. of Canada, Ltd., of S.P.A. Truck Co. and president of the Free Wheeling Patents Corp.

Executives from the Ranks

The third of the executives on whom Mr. Erskine has been placing more and more reliance each year is A. J. Chanter, first vice-president and general manager of Pierce-Arrow Motor Car Co. Mr. Chanter left the railroad business to enter the automotive field in 1911, the same year in which Mr. Erskine assumed the Studebaker presidency. He went to work in the shops of the Metzger Motor Car Co. in Detroit. In 1912 he became a road tester for Studebaker, and, like Mr. Vance, made his way steadily upward in the corporation. He became assistant to the president in 1923, and in June, 1927, he was made director of purchases. Later he functioned as manager of branches for some time before assuming the Pierce-Arrow management. He is a member of the board of Studebaker Corp. and of the Pierce-Arrow board.

Other executives, too, have been steadily developed and moved into charge of fuller responsibilities.

J. M. Cleary, for several years Studebaker sales manager, has just been named president of S.P.A. Truck Corp. He has been vice-president and general manager of that company since its formation.

E. C. Mendler, who has been manager of Studebaker's parts department, is now vice-president of the S.P.A.R. Sales Co. D. R. Grossman is vice-president and general manager of Studebaker Corp. of Canada, Ltd., and general manager of its newly formed subsidiary, Pierce-Arrow Co. of Canada, Ltd.

Motorization of American Farm Causes

Displacement of burden-bearing animals has released fodder for meat and milk producers. Truck farms have been developed in industrial areas by "amphibian" agriculturists with time to spare

THE sober charts and tables of a recent government publication* cannot conceal the dramatic influence of the motor vehicle and tractor on the life of the American farmer. In the decade following the World War, which is characterized as being "in many ways the most extraordinary period in American agriculture," the use of the motor vehicle and tractor on farms has caused a decline in the period of "over 7,000,000 in number of horses and mules, with resultant increase of 20,000,000 to 25,000,000 acres of crops to feed other farm animals, an increase of probably 12 per cent or more."

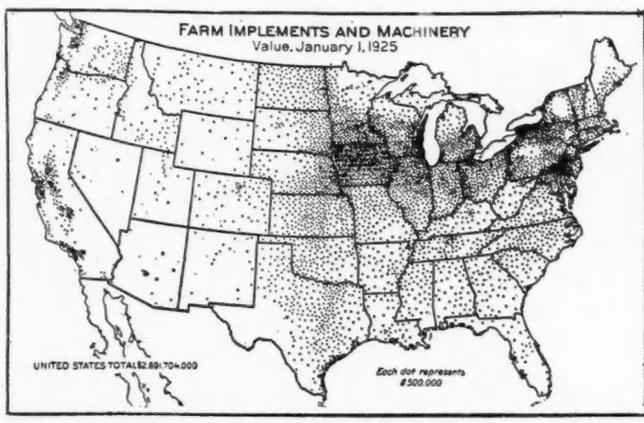
At the same time the motor vehicle has been responsible for fundamental shifts in crop geography. "The tractor and automobile have been important influences in extending grain production in the Great Plains area, with a notable decline in parts of the East, principally of wheat; while the large quantities of cheap feed released for meat and milk animals by the decline of horses in the North and West has made competition in the South more difficult, especially in meat production.

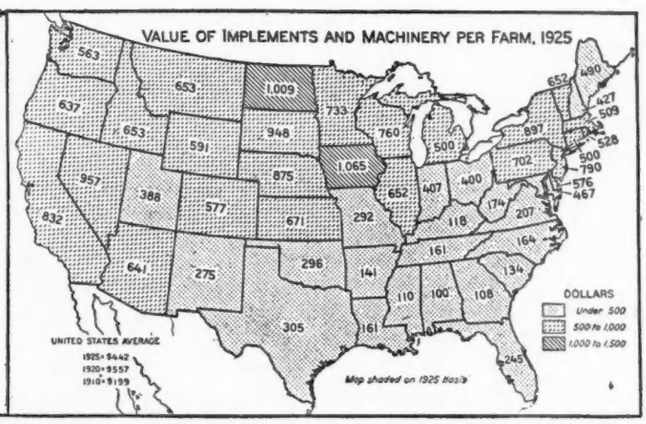
"The use of the automobile and the building of good roads have encouraged the development of vegetable, fruit, and poultry farms in industrial areas, some of which are operated by factory workers and business men in their spare hours. Many such 'amphibian' farmers, as they are sometimes called, produce enough products to meet the census definition of a farm, and thereby cause local increases in the figures of farm population. On the other hand, the tractor and associated machinery, together with other advances in agricultural technique, have made many farms on hilly or poor land remote from market as obsolete as the spinning wheel, and have indirectly caused declines in farm population and farm values in many parts of the United States that are serious."

The growth of motor vehicle utilization on farms and the development of high-type country roads have been concomitant developments.

"Probably no single factor has affected American agriculture more profoundly during the last decade than the combination of the automobile and the building of good roads. This development has reduced the number of horses and released many million acres of land for meat and milk production, thereby inducing

*"A Graphic Summary of American Agriculture Based Largely on the Census," compiled by O. E. Baker, senior agricultural economist, Division of Land Economics, Bureau of Agricultural Economics, Department of Agriculture Miscellaneous Publication No. 105. Washington, The Government Printing Office, 1931. Price, 60 cents.

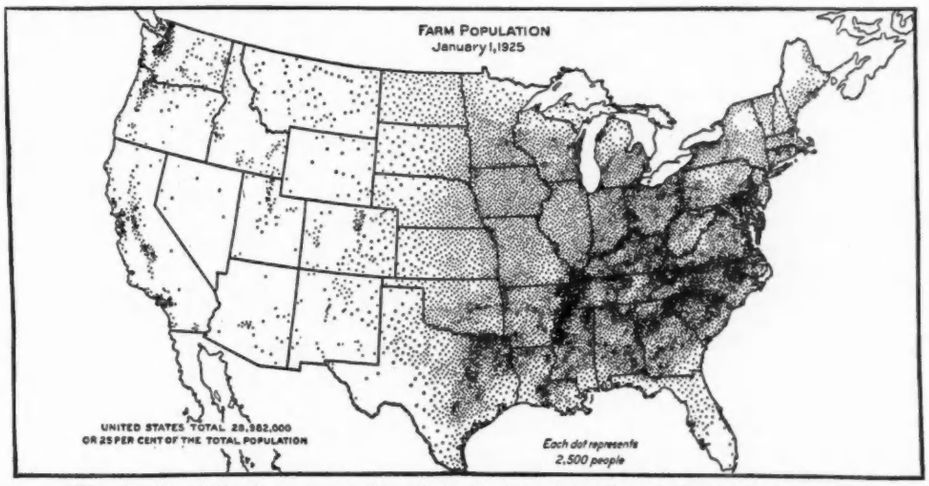




About one-fourth of the value of farm implements and machinery in the United States is in the Corn Belt and another fourth is in the hay and dairy region. The districts of greatest concentration of value, however, are southeastern Pennsylvania, western New York, and the several valleys of California. In the Cotton Belt, on the other hand, particularly the eastern and central portions, low-priced labor and the necessity of picking cotton by hand have tended to discourage the use of machinery

Iowa and North Dakota lead in value of implements per farm—over $1,000 in 1925. In Nevada, South Dakota, New York, Nebraska, and California the values exceed $800. On the other hand, in the eastern Corn Belt (Ohio and Indiana), where the farms are smaller than in the western Corn Belt (largely because of the labor of clearing the forest during settlement), the value of machinery per farm is only about $400, and in the eastern and central Cotton Belt the average value is only $100 to $150. There is remarkable uniformity in the proportion of all farm property represented by machinery, practically all areas averaging close to 4 or 5 per cent, except the hay and dairy region, where it is nearly 8 per cent

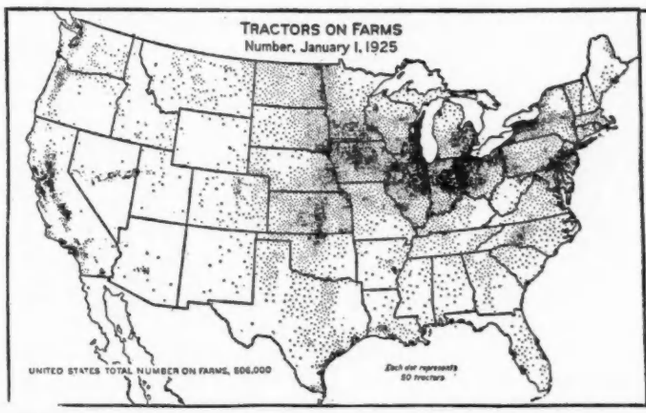
Fundamental Changes in Crop Geography



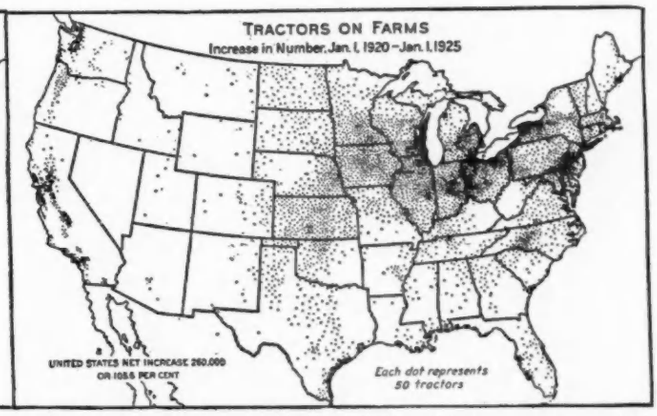
Five-tenths of the farm population of the United States live in the Southern States (south of the Potomac and Ohio Rivers and including Oklahoma and Texas), four-tenths in the Northern States, and less than one-tenth in the 11 Western States. Farm population constitutes 45 per cent of the total population in the South, 17 per cent in the North, and 20 per cent in the West. Thirty per cent of the farm population in the South is negro or mulatto, of whom 30 per cent own their farms as compared with nearly 50 per cent for white farmers. In the North 70 per cent and in the West 75 per cent of the farm population consists of farm owner-operators and their families, nearly all white

vast geographic shifts in the growing of crops and the raising of farm animals. The good roads have increased taxation, have probably raised the standard of living and have increased the efficiency of farmers and made them more responsive to new ideas and methods. It is interesting, therefore, to observe the geographic distribution of farmers living on improved roads.

"The demand for hard-surfaced roads has been met in different ways in different localities. The building of concrete or brick roads, the most expensive form of construction, by 1925 had provided only 2.5 per cent of the farmers with such a road all the way to their farms; that is, only this percentage of all farms were located on concrete or brick roads. This form of construction is most common in the densely populated, industrial, and wealthy states north of the Potomac and Ohio Rivers, and in North Carolina and California.



Tractors are most numerous in the Corn Belt, in the southern portion of the hay and dairy region, in the spring and winter wheat regions, and in California, where fertile soils and progressive agriculture are found. In the spring-wheat region and California, in 1925, about 1 farm in 5 had a tractor; in the Corn Belt about 1 farm in 6; elsewhere in the United States 1 farm in 7 to 20, except in the states south of the Ohio and Potomac Rivers, where only 1 farm in 30 to 1 in 100 had a tractor. The acreage of cotton a farmer can handle is not limited by the acreage he can plow and plant, as with wheat, or can cultivate, as with corn, but by the quantity he can pick, and a tractor can not help in picking cotton so long as it is picked by hand


TRACTORS ON FARMS
Increase in Number, Jan. 1, 1920 – Jan. 1, 1925
UNITED STATES NET INCREASE 260,000
OR 108.5 PER CENT
Each dot represents
50 tractors

The increase in tractors between 1920 and 1925 occurred mostly in the Corn Belt and in the more fertile portions of the hay and dairy region, in southeastern Pennsylvania, in the hard-winter-wheat region, and in California. The increase was notable near the large industrial centers, and less notable on the large farms in the central West, where, however, larger tractors are used than in the East. The increase in the South was small, except in central North Carolina and in Texas

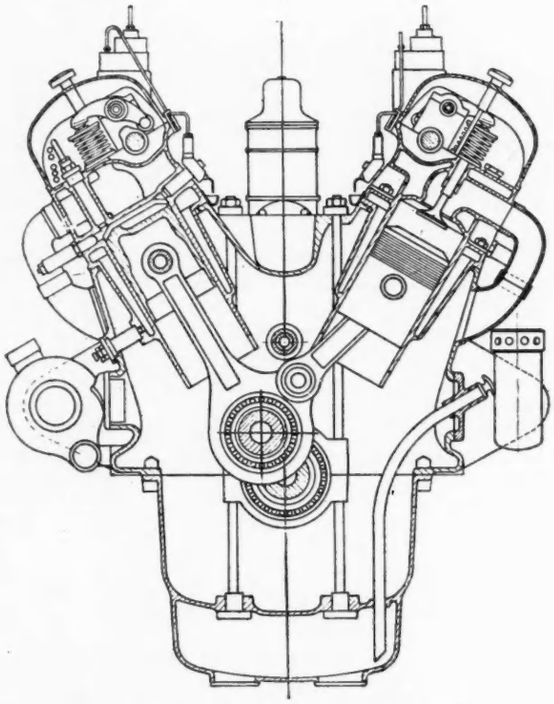
No survey of motor vehicle markets can be complete without taking into account the agricultural population. The publication from which this article is abstracted should prove valuable to all sales units in the motor vehicle, tractor and farm machinery field. Every factor which might influence sales of such equipment is presented simply and graphically.

Macadam roads provided 5 per cent of the farmers of the United States with year-round service, but in the bluegrass district of Kentucky and in northwestern Ohio nearly 50 per cent of the farms were located on such roads. Gravel roads adjoined 15 per cent of the farms of the United States, but about 50 per cent of the farms located in southwestern Ohio and in the central part of Indiana were on such roads.

"In all, therefore, about a fourth of the farms in the Nation were provided on Jan. 1, 1925, with hard-surfaced roads all the way to town. But in New England, New York, Michigan, Wisconsin, and California a third to a half of the farms adjoin hard-surface roads, and in Ohio, Indiana, Oregon, and Washington over half of the farms are so located.

"Improved dirt roads adjoined 31 per cent of the farms and unimproved dirt roads 43 per cent of the farms. About three-fourths of the farmers, therefore, were still living on roads that commonly become well-nigh impassable for automobiles in early spring and occasionally at other times of the year. In the Great Plains States about 95 per cent of the farmers lived on dirt roads. But doubtless many of these farmers had hard-surface roads part of the way to town.

"The automobile has, apparently, increased the number of small farms more rapidly than the tractor has increased the number of large farms."



Section through the new Maybach Diesel engine

New Maybach Diesel Built for Rail Cars and Marine Use

MAYBACH MOTOR MFG. CO. of Friedrichshafen, Germany, which has been manufacturing high-speed Diesel engines with air injection for about a decade, has now added two types of engines with mechanical injection, one a six-cylinder, 5.52 by 7.09 in., delivering 150 hp. at 1300 r.p.m., and the other a 12-cylinder V, 5.91 by 7.88 in., delivering 410 hp. at 1300 r.p.m.; the b.m.e.p.'s figure out to 71.5 lb. p. sq. in. and the specific weights to 13.2 and 9.35 lb. p. hp. respectively. The structural design of these engines is based upon that of the Maybach engine for airships. Roller bearings are used on the crankpins, and in the V engine one set of connecting rods is articulated to the other set. In the V engine both the upper and the lower section of the crankcase are made of aluminum alloy, and the cylinders are set into the crankcase, as is customary in Maybach automobile engines. Inlet and exhaust valves are operated through an overhead camshaft which is driven from the crankshaft through spur gearing at the flywheel end. Both engines draw their air through the crankcase, which keeps the oil in the crankcase at a moderate temperature. Should the oil pressure drop below a certain value the engine is automatically stopped by opening of the injection valves. Fuel is injected directly into the combustion chamber through an injection valve located at one side. Starting is by compressed air.

These engines are intended for use on railcars, boats and marine lighting sets. In the case of marine engines the operator does not act directly on the pump to control the speed of the engine, but on the governor spring, and the governor then changes the delivery of the pump.

The air injection engine is being continued for use on rail cars with mechanical drive. It permits of starting the car under full load with the air starter.

—*Automobiltechnische Zeitschrift.*

JUST AMONG OURSELVES

Want List For 1931

FOR 1932 may we wish you plenty of work to do, reasonable compensation for doing it, ability to create something useful, be it a product, an idea or an organization, and an increase in the flexibility of your mind. All of which is just a long way 'round to saying that we wish you a *Happy* New Year.

Pressure Off Car Stocks

SHARP curtailment in production in October and November brought new car stocks to the lowest level they have reached probably in a decade. Comparison of output and registration figures indicate that total stocks on Dec. 1 did not greatly exceed 100,000 units, which is an average of a little better than two cars per dealer. The decrease in dealer stocks in 1931 approximates 200,000.

Used car stocks also have been declining steadily through the year, and at the present time the number of used units on hand is about 10 per cent lower than a year ago, while their value has decreased about 15 per cent during the same period.

Sanctum Bombs; Market Squibs

ONCE taken, our actions never seem so radical as when we contemplated them. A design which in prospect seems revolutionary, in retrospect looks just a little unusual. It's true in the publishing business; it's true in the automobile business.

The editor fearfully, cautiously decides upon a major innovation in the appearance of his magazine. He changes the headline type completely! Then he sits back to wait for the excitement. Will old readers be shocked by it and turn away from his articles? Will newer readers write in and compliment him on the changed appearance? The editor who makes such a change with such an expectation will be waiting till the crack of doom for his excitement. It just doesn't take place. What seemed to him from his technician's viewpoint to be a major innovation—and he can prove that it is to those who will listen—is just a minor readjustment in the eyes of his readers.

And so it is in automobile design. What appear to be bombshells when first exploded in a conference of company executives will just be little firecrackers when they hit the market a year later. We've got to dynamite our own conceptions if we are even to stir appreciably those of the public.

The Buyer Is A Skeptic Bird

THERE are more new things in automobile design this year than in any previous year for a long while back. Honest progress has been made. Strong bids for renewed public attention are being put out.

Contrary to previously advanced opinion, nobody yet has "shot the works" from the standpoint of radical engineering design. In many car company engineering departments, designs and information already exist for technical programs far more radical than anything which now seems likely to be on the market in 1932.

No Occasion for Handkies

WELL, the body builders have begun tear dropping as predicted. Clear tendencies in that direction are evident in the New York Salon. Seems as though only half a tear had been dropped in most cases, however. Sort of a choked sob, as it were. That's the impression we got after wandering around the salon.

The "tear-dropping," in other words, has just gotten as far as the rear of the hood. On several models it starts boldly at the gasoline tank in the rear, sweeps radically yet rhythmically over the side panels and top and fully preserves its daring newness right up to the windshield. Then it suddenly seems to stop short, embarrassed as a temporary Nudist at a Methodist picnic.

On such parts of such bodies as "tear-dropping" has been done, though, beauty of contour and consonance of line have been successfully achieved to a marked degree.

Study of the examples of this trend on display at the salon should furnish real food for thought to car makers and body designers who have recently been debating whether or not the fully streamlined car must come by gradual stages or in one or two big jumps from current practice. Six months ago we were definitely of the former school of thought. Today—six months of looking at a lot of different "tear drop" designs and beginning to get the emotional feel of their functional harmonies—we begin to lean toward the one big jump idea.—N.G.S.

Machined Wood Parts Produced With

by Joseph Geschelin

ALTHOUGH physical size and capacity as well as financial standing are essential criteria in determining the status of a parts maker, the really basic factors are: 1. Cost and quality of the product. 2. Service to the buyer. 3. Research and development facilities. These loom even more pointedly if we believe that the very future of the automotive industry hinges on engineering progress.

It was therefore these criteria that the writer applied when we were afforded the courtesy of studying the manufacturing operations of the Mengel Body Co., Louisville, Ky.

This company specializes in the production of machined wood parts which constitute the structure of the composite or steel and wood body. And since only those specially engaged in wood working can appreciate without explanation the service features and otherwise hidden values in the utilization and machining of wood, it is the object of this article to treat these elements in detail.

Some idea of the size of the enterprise may be gained from the fact that the new plant of the Mengel Body Co. has a productive floor space of 500,000 sq. ft. Its machining capacity is 7,000,000 gross board feet per month which is equivalent to about 1000 to 2500 bodies daily.

By virtue of favorable geographic location, this company is close enough to the automotive manufacturing industry to serve users promptly and economically, yet it is centrally located with respect to the lumber country and can draw its supplies from a wide area. This is evident from the following list of the woods that are readily available—oak, ash, gum, magnolia, soft maple, hard maple, beech, northern elm, southern elm, and yellow pine.

In the regular course of events, operations start with the unloading of lumber from freight cars at the siding shown in Fig. 1. This first step has a vital bearing on the quality and serviceability of the finished machined parts. Lumber is unloaded on the covered platform at the right which consists of a series of tracks each provided with a *"lowerator"* which carries the platform trucks on which the stack is piled. The function of the "lowerator" is to progressively lower the pile of lumber as it grows, thus maintaining a comfortable working level for the stackers and inspector. Lumber is stacked in uniform piles, each consisting of the same kind and thickness of lumber and the same lengths. The chief feature of the operation and one which has been commented on in a recent survey by the Department of Agriculture is the fact that each layer is separated by a large number of sticks of uniform cross-section, evenly spaced. This prevents sagging and distortion while in the kiln.

When the stack has been built up to the required height it is shifted to green storage at the left and ultimately progresses to the kilns at the other end of the yard. This particular plant has an installation of 30 dry

Fig. 1—The lumber is unloaded from cars to kiln trucks by "lowerators" or elevators

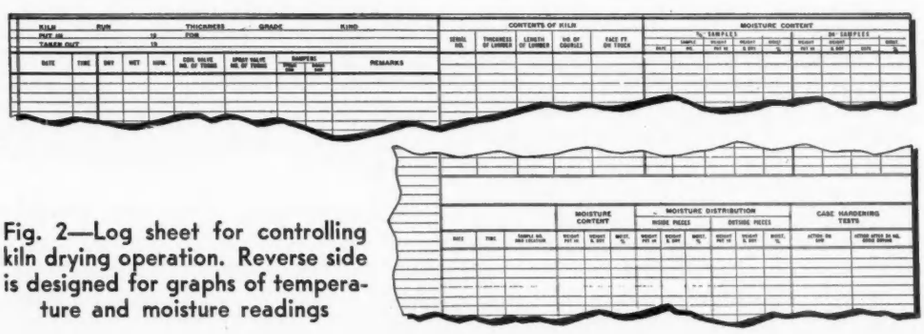


Fig. 2—Log sheet for controlling kiln drying operation. Reverse side is designed for graphs of temperature and moisture readings

Metallic Precision in Mengel Plant

Scientific analysis applied at critical points in using 7,000,000 board feet of lumber a month to make the equivalent of 1000-2500 "skeleton" units daily

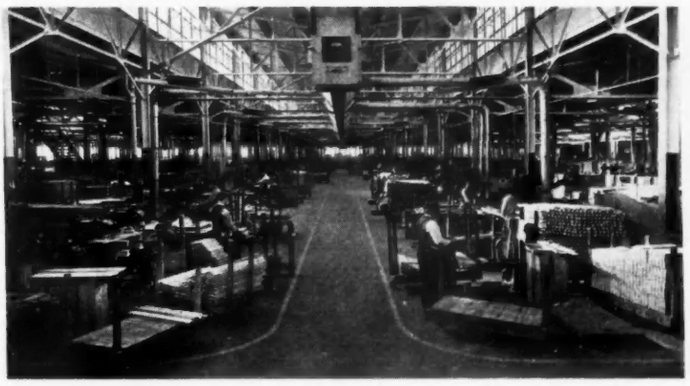


Fig. 3—View of the finish mill. The rough lumber comes in at the far end and travels in straight lines to finish

kilns which, we understand, is one of the largest in the country. An interesting detail is the fact that each track leads directly to one of the kiln openings, thus holding handling operations to the very minimum. In fact the only real handling is at the loading platform and when the material is finally sawn in the rough mill.

Interestingly enough, case hardening, so familiar in metal working parlance, is also found in wood working, but with wood it is not desirable and care is taken to avoid it. A publication of the Forest Products Laboratory* gives a technical explanation of the phenomenon. Quoting from this we find that case hardening is "A condition of wood which contains stresses produced by a difference in shrinkage between the surface and center of a board when the moisture content is equal throughout. This stress is not to be confused with the stress produced by bending under a load or the internal stress produced by a difference in shrinkage due to difference in moisture content. No matter how perfect the external appearance of a board may be, its serviceability is greatly reduced if it has dried without normal shrinkage."

It is evident from a study of the literature and art that kiln drying is a vital and critical operation. Scientific control at this point, therefore, is of greatest importance.

Although the Mengel organization has done much work in drying lumber and veneers, it has also used the information and methods of the Forest Products Laboratory where a number of its men have received training. The first formal operation prior to kiln drying is a sampling of the moisture content of the lumber in a given stack. This gives the operator approximately the condition of the lumber and the treatment required. In practice, a kiln charge is heated up and the air in the kiln brought to the saturation point in moisture content by the application of live steam. After saturation the procedure is to increase the temperature and gradually lower humidity. This requires careful watching and constant testing as the changes must be brought about gradually in accordance with the behavior of the charge to avoid case hardening.

Laboratory tests of the charge are made daily, using standard test pieces as recommended by the Forest Products Laboratories. Fig. 2 shows a log sheet which is used in recording readings on each charge. The reverse side is used for plotting the curves for temperature and moisture content.

At the end of the run the temperature is at a maximum while moisture content is at a minimum consistent with customary practice. At this point the charge is permitted to cool slowly. After cooling, it is delivered to the rough mill. So far as we can learn, one of the secrets of the successful operation of the kiln job is the well-designed and readily accessible control tunnel which the writer examined. It is roomy, and well lighted, making it possible to read the instruments and work the control valves with facility.

An excellent perspective of the machining plant is afforded by Fig. 3 which is a view of one of the bays of the finish mill. Rough lumber comes in at the far end and moves in an approximately straight line to the foreground where the finished parts are ready to ship. Overhead is the trunk duct which carries away shavings, dust and chips to a battery of "cyclones" from which this waste material is taken to two shaving bins which hold about 300 tons of shavings and saw-

*Stresses and Detection of Case Hardening During Kiln Drying, by W. Karl Loughborough.

Fig. 4—Patterns, production fixtures and checking fixtures are made here

dust. From this bin it is carried by conveyors to boilers designed especially to burn this type of fuel.

All productive labor in this factory operates on a group bonus plan which incorporates a number of unique features. In the rough mill where the lumber is prepared for machining, wage payments are based on the waste produced in preparing a standard unit of lumber. Carefully prepared standards give the permissible waste. If this minimum is further reduced, the group gets the benefit in the form of a bonus. But they go still further by relating waste to the dollar value of lumber in work. This means that a greater waste is permitted in working lower grade material, thus providing additional incentive for the most economical utilization of lower grades. There is also a bonus factor covering production.

In the finish mill there are groups of varying character. For example, one machine line may produce only a single kind of operation while another is responsible for all the operations of a complete unit. However, in every case, wage payment depends on the number of pieces passing final inspection at the end of the group. In the finish mill, the standard cost includes an allowance for repairs; but it also carries a penalty for losses exceeding this allowance. The chief feature of this group payment plan from an academic as well as practical point of view is that there is no guaranteed base rate.

Perhaps the most important activities from the point of view of the user of the machined wood product are those of engineering and research. Even a casual survey shows the remarable scope of activity directed toward improvement in design and greater economies in manufacture. Fig. 4 shows a part of the pattern experimental shop adjoining the engineering department. Here machined parts are detailed directly from original body drafts and the production fixtures, templates and jigs designed and built.

For every new body job, a complete frame is built up from production pieces to check accuracy and correct fitting. One of these jobs is in process of construction in the foreground.

While going through the engineering department, the writer was greatly impressed by the amount of thought and engineering behind the design of even the most minor machined parts. This is no exaggeration and, to demonstrate just what we mean, let us analyze the design of a new seat back top rail side arm, its checking fixture, and shaper jigs.

At the top, in Fig. 5, is shown the template of the finished piece complete in every respect with finished dimensions inked in as may be indistinctly seen. Time was when such a piece would have been cut directly from one large solid block. But today this would be poor engineering, since it involves needless waste of material; also because the direction of the grain in certain critical parts would weaken its resistance to stress. Below is shown the design of the final rough mill piece. It is made up of three sections presenting the proper direction of grain, fastened together permanently and securely by means of glued lock joints. The whole thing is beautifully conceived, utilizing small pieces which might otherwise be wasted, although an even more important result is the reduction of the finishing cuts to an absolute minimum. Also a stronger, better part results.

What is done to secure precision in dimensions and contour? The lower view in Fig. 6 shows the checking fixture for this piece. Each of the metal projections and hinge plates is designed to check some key element of the piece. For example, the two vertical hinges check steps in the height of the piece which increases progressively from the right to the left. The square steel plug at the left checks the slot in the finished piece. Probably the most interesting feature of this checking fixture is that it may be employed to check individual operations beginning with the first in sequence. This is a big improvement over customary procedure in which only the finished piece can be inspected.

At the top is the shaper jig embodying some striking engineering features designed to assure accuracy and safety for the shaper operator. In wood working, the shaper always has been a prolific source of accident. But this is practically a thing of the past in the Mengel plant. The shaper jig is made heavy and with considerable overhang at the leaving edge. The metal piece at the left is a high semi-circular guard for the workman's hand. Hidden from view is a vertical post which acts as a grip for his hands. It gives adequate protection and enables the workman to handle the fixture with facility. Two, three, and four such guards are used on other fixtures depending upon the size of the work. Other interesting constructional de-

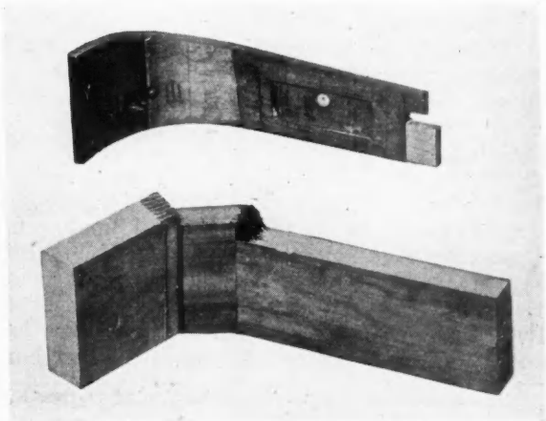


Fig. 5—Layout and rough stock for seat back top rail

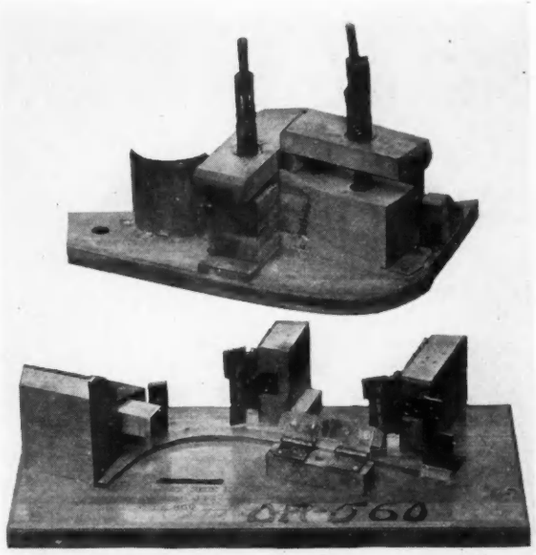


Fig. 6—Shaper form and checking jig for seat back top rail

tails are the quick-acting clamps at the top and the metal friction plates at the bottom which helps hold the work securely without danger of its slipping out and causing injury to the operator or machine, or inaccuracy in shape.

Both shaper forms and checking jigs are mounted on heavy, kiln-dried three-ply bases which provide a rigid substantial support and eliminate the danger of warping.

Glued joints are, by the very nature of things, a very vital element in any wood structure. And it assumes a lot of importance from the user's point of view because there is just no way of checking a finished joint except by a destructive test. Consequently, glue control and glue practice constitute one of the major activities here.

On the basis of scientific work as well as practical experience, Mengel engineers have developed a standard practice covering desirable proportions of glue and water. These proportions are changed seasonally to compensate for variations due to temperature and humidity. Batches of glue are tested daily and checked with a university laboratory in the city. Occasionaly test samples are sent to Forest Products Laboratory as an additional precaution.

Mengel uses both animal and water-resistant casein glues of the highest quality obtainable. Glue is made up fresh each day in quantity sufficient only for immediate use. On hot glue, the temperature of the converters and individual glue pots is accurately controlled by means of automatic thermostats.

In production, the glued joint is assembled and held under a predetermined pressure for a given length of time. The values of pressure and time are based on a long range study of glued joints produced under various conditions. The surfaces to be glued are also carefully prepared for best results.

Now for some figures which may substantiate some of the claims for accuracy and safety. A check-up made for the purpose of this article shows that in the case of one of their large customers, rejections for the past twelve months were less than five hundredths of one per cent. This was on shipments of over 50,000 bodies consisting of more than six million parts and assemblies and delivered to a number of assembly plants.

As to safety, we might well quote from a letter just received from Mengel: "We also mentioned to you the extreme pains we take in the matter of safety, starting our efforts with the production fixtures and machine set-ups. We intensified our work on safety in 1928 and during that year reduced our accidents about 90 per cent of the previous year. In 1929 one of our plants was awarded the trophy given by the Louisville Safety Council in competition with 43 other industrial plants of this city. This was for making the biggest improvement in safety during the year. This plant is third in this year's contest and our other plant is first.

In spite of the tremendous percentage of reduction in accidents made during 1928, we made almost as large a percentage reduction during 1929 over 1928 and a still larger reduction in 1930 over 1929. Our record for 1931 to date shows about the same percentage improvement over 1930, all of which boils down to the fact that we now have extremely few accidents."

The foregoing gives in a necessarily brief way some of the activities of this organization. The things that impressed us particularly were the emphasis on economy in design and in cost, and the maintenance of rigid accuracy so vital to uninterrupted production on the body builder's line. The productive capacity of this plant and its ability to turn out the product on schedule are eloquently expressed by the figures given earlier.

Kyano—A New Blue-Printing Process

A NEW blue-printing process known as the Kyano, has been developed by the C. F. Pease Co., Chicago, Ill. It is designed for use on the Pease blue printing machines, and it is claimed that exceptionally fine color blue prints and blue-line prints are obtained by the process.

One of the advantages claimed for the new process is that it prevents all bleeding or running of blues into whites, thus enabling the operator at any time to make blue prints along with blue-line prints, side by side or in succession, at the same printing speed, and obtaining a razor-edge line of demarkation.

The new process, moreover, produces a deep, rich blue from fast printing papers.

"Kyano" chemical, for use with the Pease "Kyano" process attachment, is packed in dry, pulverized form. The capacity of the "Kyano" chemical solution tank is 10 gal.

After preparing the solution according to directions, the complete mixture is poured into the copper supply tank. Next the paper is threaded through the "Kyano" process attachment and operation is then ready to begin. Tracings and negatives are fed into the blue-printing machine in the regular manner. When the first exposed prints are near the top of the attachment, before entering the developer, the "Kyano" process pump at the right hand side of the attachment is started and valves of chemical delivery tubes are opened about half-way, sufficient to insure a constant puddle of "Kyano" solution to cover two stainless steel rolls that revolve against the exposed paper.

Momentum-Boosted Braking System Gives

Pedal pressure actuates power unit on Stewart-Warner device, which can be built into transmissions on new cars, or added to circulating cars as an accessory

MANY interesting mechanical features are embodied in the four wheel, mechanical, power-actuated braking system recently announced by the Stewart-Warner Corp., Chicago, Ill. Use is made of the momentum of the car to apply the brakes. The driver, of course, presses on the pedal when he wants to stop the car or reduce its speed; but the pressure exerted by him serves only to bring the so-called power unit into action, and the latter, acting as a force amplifier, produces a pull on the brake linkage which is a direct multiple of the pedal pressure. Thus the operator is in position to accurately control the braking effect, and the pressure he needs to exert on the brake pedal is only a small fraction of that which would be required to produce the same effect without the power unit.

The advantages claimed for the new braking system may be summarized as follows:

1. Low pedal pressure required
2. Brake application in direct proportion to pedal pressure
3. Great linkage-travel reserve
4. High mileage between adjustments
5. Adjustments easy to make
6. Original division of force of application between front and rear brakes maintained
7. Steering not interfered with by brakes
8. Simple construction
9. All parts except camshafts interchangeable between front and rear brakes
10. Adaptable to cars in all price classes

The Stewart-Warner power unit is a self-contained unit which can be used also with other makes of brakes and various types of hook-up. In original installations the power unit is either built into the transmission at the rear end, or made a self-contained unit in a two-part housing which is bolted to the rear of the transmission housing. A sectional view of a built-in unit, arranged for Hotchkiss drive, is shown in Fig. 1. The power unit is actuated by means of a control-yoke A with trunnions supported in the wall of the housing. One of the trunnions extends beyond its bearing and has a lever arm secured to its end, from which connection is made to the brake pedal. There are two fingers on the control yoke, and when the operator presses down on the brake pedal, these press against the pressure-plate B, which in turn presses against the friction disk C, clamping it more or less firmly between the pressure plate and a finished surface D in the housing.

In order to prevent the disk from being grabbed, it is made as shown in the drawing. It is composed of two high carbon-steel disks of concaved form, which are riveted to the splined hub E riding on the outer threaded actuator F. Each of the steel disks is provided with a fabric facing. Owing to the concaving of the steel disks, the friction facings are not parallel

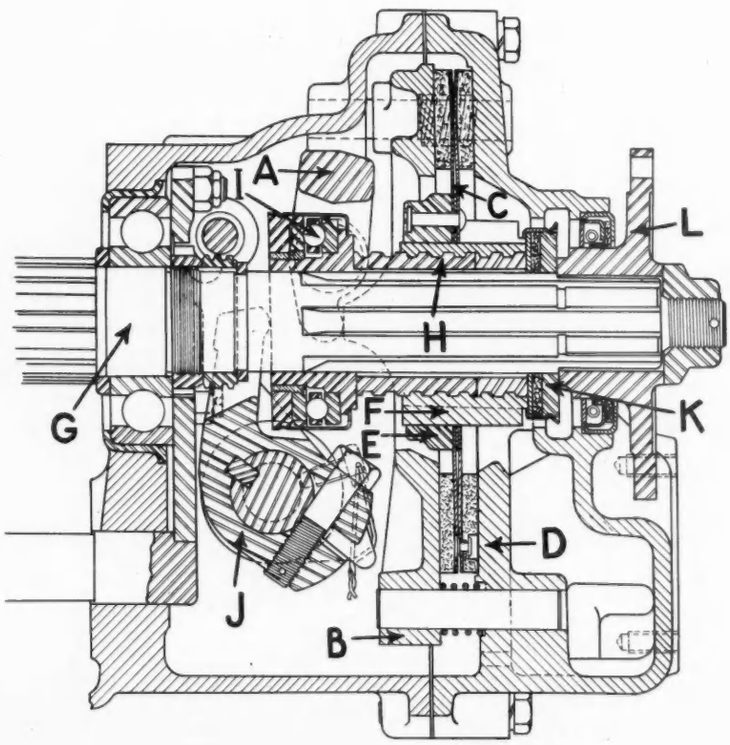


Fig. 1 — Longitudinal section through in-built power unit designed for use on cars with Hotchkiss drive. (Parts shown in position they occupy when brake is applied while car is running backward)

Accurate Stop

by
P. M.
Heldt

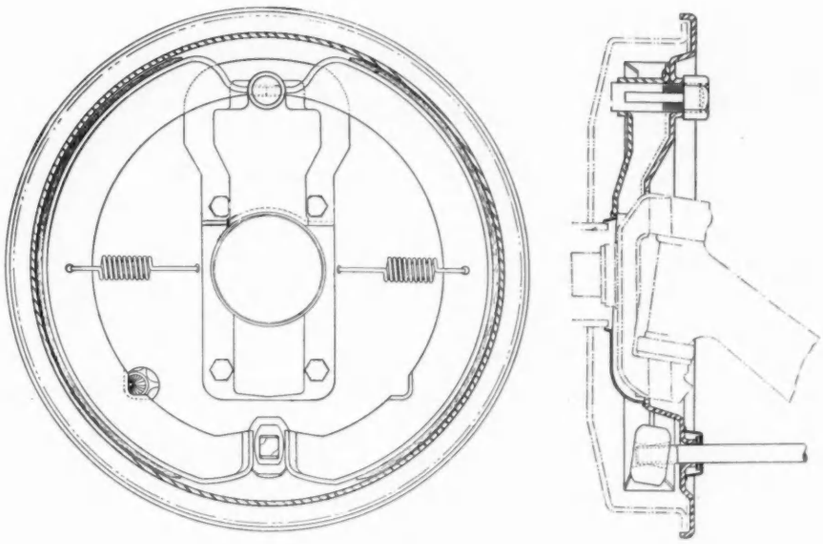


Fig. 3 — Two sectional views of the wheel brakes

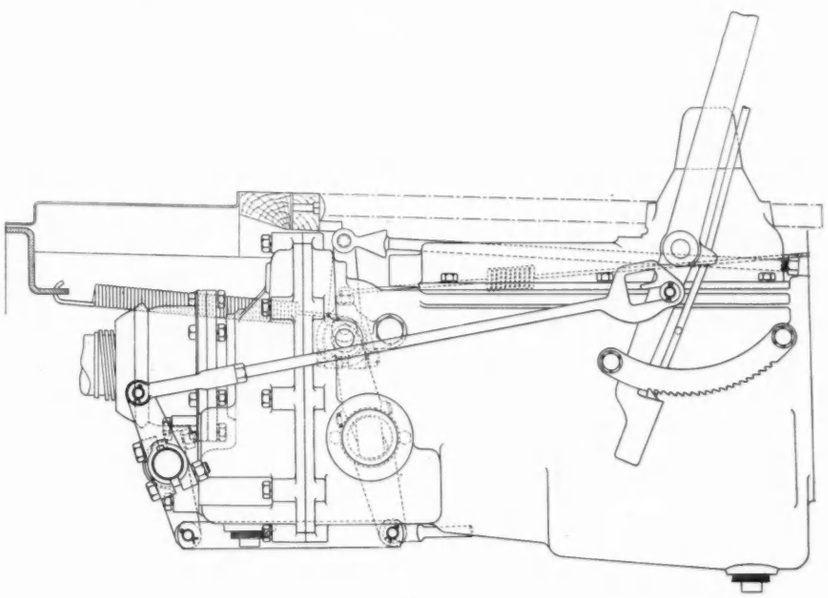


Fig. 2 — Booster link for hand brake

with the metal surfaces between which the disk is located, and when the friction faces are brought into contact, the pressure of contact increases gradually as the distance between the two metal surfaces decreases.

When the brake is disengaged, the hub E rotates with the transmission drive shaft G, but as pressure is being applied to the disk C by the non-rotating parts B and D, its speed is reduced and it therefore begins to turn relative to the transmission shaft G. On the inside of the outer actuator F there is a right-hand thread of steep pitch, which engages with a similar thread on the outside of the inner actuator H, the latter being splined to the transmission driveshaft G. Both of these actuators abut against a thrust bearing I which is interposed between them and the output yoke J.

A brake-operating or distributing lever is mounted on one or the other end of the output yoke, or there may be one such lever at each end. The lever is not

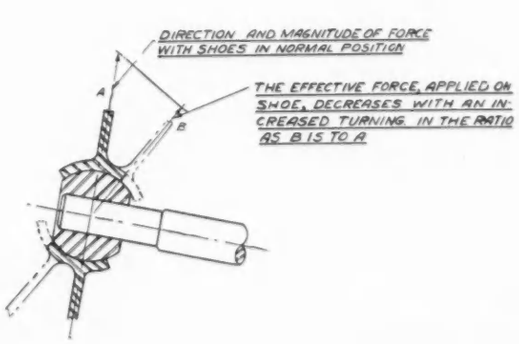

DIRECTION AND MAGNITUDE OF FORCE WITH SHOES IN NORMAL POSITION
THE EFFECTIVE FORCE, APPLIED ON SHOE, DECREASES WITH AN INCREASED TURNING IN THE RATIO AS B IS TO A
A
B

Fig. 4—Diagram indicating how pressure on brake shoes is reduced when front wheel is deflected from the straight-ahead position

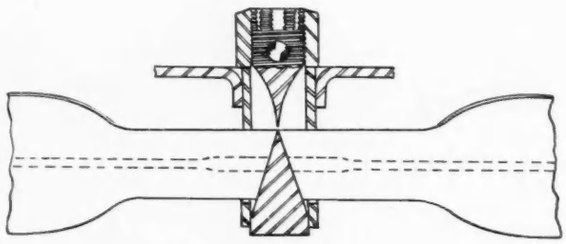


Fig. 5—Means of adjusting brake for wear of lining

rigid on the yoke angularly, but has enough free play thereon so that the brakes can be applied by the hand lever independent of the power unit.

There is a thrust collar K between the actuators and the hub of the companion flange L, which is designed to absorb the shock when the actuators are released and end up against it. This collar consists of two metal disks or washers with a layer of resilient material between them.

Depression of the brake pedal causes the pressure plate B to be moved backward against the friction disk C. The resulting gradual retardation of the disk rotates the outer actuator F relative to shaft and causes it to screw over the right-hand thread of the inner actuator H, thus applying the brake through the output yoke J and the thrust ball bearing I, which latter is free on the shaft and abuts against the actuator.

The inner actuator remains stationary in the axial direction, being pressed against the thrust collar K by the reaction of the force of application. The force applied to the output yoke is in direct proportion to the pedal pressure. In normal brake operation the disk revolves only about a tenth of a turn relative to the shaft, but provision is made for a maximum forward movement of ¾ in. for each actuator, this being equivalent to about twice the travel of the brake rods in a conventional pedal-operated brake.

When the car moves backward, the outer actuator F abuts against the thrust collar K and its rotation relative to the shaft forces the inner actuator H forward on the shaft, this action applying the brakes through the output yoke J and the thrust bearing I in the same way as when the car moves forward. When the brake pedal is released, the angle of lead being such as to make the mechanism completely reversible, the actuators return to the "off" position, and the shock of contact is absorbed by the buffer thrust collar K.

The actuator thrust bearing is of such design that it can slide freely on the shaft, and that it cannot score the shaft as the result of its spinning thereon. A shock-ring is incorporated in the bearing to absorb localized pressures due to the fingers on the yoke, and to prevent damage to the bearing from such pressures. We are informed that the materials for the actuators were selected and the lead and form of the thread so developed that the maximum leverage can be obtained with complete reversibility. It is stated that the power-unit housing will retain an ample supply of lubricant even if the supply in the transmission housing runs low.

When the power unit is used, the maximum available travel of the ends of the distributor lever is twice as much as in a conventional system in which the brakes are operated by pedal directly. This, of course, assures long life of the brake linings between adjustments, but it introduces a problem with relation to the effectiveness of the hand brake throughout this life. This has been solved by providing what is known as a booster link between the brake lever and the distributor lever. As shown in Fig. 2, the connecting link is provided with a slotted head at its forward end, there being two slots of different lengths in the head. Every time the brake is applied by the power unit, the stud on the brake lever will slide toward the rear of the long slot in the booster link, and when the wheel brakes have worn to the point where the hand brake is about to become ineffective, the booster link will drop and the stud on the brake lever will enter the upper short slot, which is equivalent to shortening the link. With the stud in this position the hand brake will be effective until the actuator of the power unit travels to the limit of its motion.

With ordinary direct foot-operated brakes it is necessary to multiply the force of application by the linkage. As we pass from the brake pedal to the wheel brakes, the torque on succeeding shafts gradually increases, while the angular motion of the shafts correspondingly decreases. Since the final shaft—the brake camshaft—must have sufficient motion to permit of the brake clearance and any expansion of brake drum and compression of lining being completely taken up, the brake pedal naturally must have a rather wide range of motion. With an amplifier (power unit) in the line, the need for torque multiplication by the linkage is reduced, and the range of pedal travel therefore can be made relatively small. This has the advantage, according to the manufacturers of the Stewart-Warner brake, of making it easier to shift the foot from the accelerator pedal to the brake pedal, thereby reducing the elapsed time between the moment the driver realizes the need for a quick stop and the moment he begins to press down on the pedal. It is obvious that when the right foot is on the accelerator and the latter is well down toward the limit—as it always is when driving at speed—shifting the foot to the brake pedal is easier the nearer the pad of the latter is to the toe board, as the foot then needs to be lifted less.

The wheel brakes of the Stewart-Warner system are of the two-shoe, cam-actuated type, as shown in Fig. 3. With the use of a separate power unit there is, of course, no need for multiplication of the effects of pedal pressure by application of the wrapping principle. The shoes are produced from a special rolled steel bar of T-section. They are forged from these rolled bars to give them the shape of a circular arc, and the

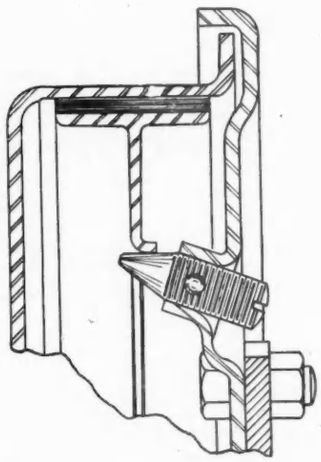


Fig. 6—Means for centering brake in released position

anchoring end and cam plates are forged integral. The material used for these shapes is a high-carbon steel, and the shoes are heat treated and have hardened cam-plate and anchoring surfaces. All parts are interchangeable between front and rear except the camshaft proper, and with cooperation of the car factory engineering departments the brake backing plates also can be made interchangeable.

Each pair of shoes is actuated by a cam mounted on a floating camshaft. Strong retracting springs on the shoes hold the cam firmly in place and effect a quick release of the brake. The contact surfaces of the brake shoes are so designed that they hold the cam in position in the drum endwise and also on center, regardless of the movement of the shoes away from the axle when expanded. The cams have rounded (barrelform) surfaces, which position the shoes when the brakes are released.

The cams are mounted on formed ends of the camshafts, and the openings in the backing plates through which the camshafts pass are closed by means of metallic sliding covers, thus keeping dirt and moisture out of the brake drums. The levers at the ends of the camshafts are forged on.

An interesting point is incorporated in the distribution linkage. In four-wheel braking systems it is often desirable to divide the brake-operating force unequally between the front and rear brakes, depending on the weight distribution between front and rear wheels when the brakes are in action. With equal sized brake shoes unequal application involves unequal rates of wear of the linings, and in order that the original distribution may be maintained, it is necessary that there be greater travel of the shoes having the greater rate of wear. This end is achieved in the Stewart-Warner brake by providing the brake with the most rapid wear with a shorter cam lever so that with an equal-armed distribution lever a given angular motion of the distribution lever results in a greater angular motion of the cam of the brake having the greatest rate of wear. If the rate of wear is directly proportional to the pressure between shoes and drum the distribution of forces of brake application will remain substantially constant as the lining wears away.

In order that the steering may not be affected by application of the brakes, the cams are so located that their center is in the axis of the knuckle pin. When the front wheels are turned the brake shoes with their contact surfaces revolve about the cam, and the brakes are released in proportion to the cosine of the angle through which each of the front wheels is turned (see Fig. 4). Under this condition the force of application is resolved into two components, only one of which acts normal to the cam plates. Therefore, in turning corners the front brakes are gradually released, thus permitting the front wheels to keep on revolving and performing their steering function. Another feature of the brakes which tends to prevent locking of the steering wheels and consequent loss of control is that as soon as the rear wheels lock it is impossible to obtain a further increase in the force of brake application, no matter how hard the operator presses on the brake pedal.

On the Stewart-Warner brake there are two adjustments, one to take up for wear of the lining and the other for centralizing the shoes within the drum when in the released position. As shown in Fig. 5, adjustments for lining wear are made by means of a stud at the point of anchorage. This stud is milled with grooves in opposite sides, the bottom surfaces of which are inclined. Against these bottom surfaces rest the hardened inclined ends of the brake shoes. The stud is held and guided in a hollow brake anchor bracket welded to the backing plate. It is urged in one direction by the reaction of the brake shoes against its inclined surfaces, and it can be drawn in the opposite direction by means of the adjusting nut, which is provided with a locking ball. When sufficient wear has occurred to warrant adjustment the adjusting nut is drawn up. Each click of the locking ball registers an adjustment of 0.001 in. at the center of the shoe.

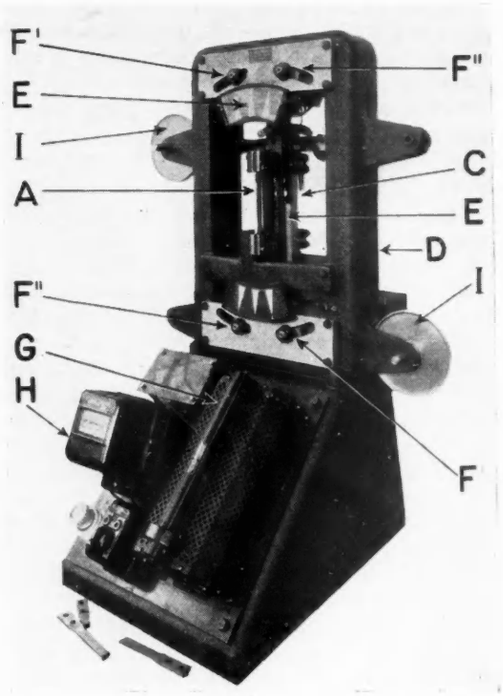
Adjustment to centralize the brake shoes in the drum is made by means of a set-screw with tapered sides, as shown in Fig. 6. This screws through a threaded boss formed on the pressed steel backing plate, the point entering a notch in the inner edge of the web of the brake shoe. The web is turned over at this point to form a flange designed to give adequate bearing surface. The adjusting screw being at an angle with the axis of the brake and serving as a stop for the release motion of the shoe, if screwed further into the backing plate it reduces the available release motion, and vice versa. The same type of ball lock as on the wear adjustment is provided on this adjustment.

Ford Ships DeLuxe Plane

THE interior of the new Ford trimotor deluxe club plane which has just been shipped to England. The cabin is fitted with six reclining club-type chairs and a three-place divan, finished in dark green colonial grain

leather. The lower wall panels are of oriental walnut, surmounted by a decorative frieze depicting English hunting scenes. The plane is equipped with many features which make it ideal for aerial tours.

Tests Simple Shapes for Both Static Bend and Repeated Loading



Southwark combined static bending and endurance testing machine; when used for endurance tests machine stops automatically when specimen fails

A UNIVERSAL machine permitting of both static bending tests and endurance tests under repeated cycles of bending load is being offered by the Testing Equipment Division of the Southwark Foundry & Machine Co., Philadelphia. The machine is known as the Foepple-Heydekampf type of bending machine and is claimed to be easy to operate and to make use of specimens of simple shape. When used as a fatigue-testing machine it determines the endurance limit, which is defined as the stress which the specimen will withstand for an indefinite number of cycles without fracture.

The frame D of the machine is a light-alloy casting. Into its lower part is built a switch panel on which are mounted the necessary operating and controlling instruments. To make the set ready for use it is connected to a source of direct current of 110 or 220 volts.

The lower end of the specimen A is rigidly clamped to the frame D, while the top end is connected to an oscillating mass B of considerable length. Usually tests on two specimens are run at a time, and in the illustration one specimen is shown already broken and the lower part removed from the frame. The machine, however, may be used equally well for a single specimen.

Two thin flat springs C are mounted in a similar way behind frame D and oscillating mass B; they are thinner than the specimens and are not intended to break. These springs C, the specimens A and the mass B form a mechanical swinging system, which is excited by two pairs of electromagnets F^{I} and F^{II}, alternately giving impulses to the mass B. The magnets are switched on and off by a lever contact device, not visible in the illustration. The switch lever is moved by the mass B through friction, so that the number of impulses agrees with the natural frequency of the oscillating system. The exciting magnetic forces change their direction in the end position of the swing. Once slightly touched by hand, the system starts and keeps on swinging "in resonance" and requires very low power (not over 0.3 kw.). The amplitude of the oscillation is varied by changing the current in the electromagnets F by adjusting the rheostat G.

The oscillation is a rotary reciprocating movement of the mass about an axis through the middle of the specimen. The angular amplitude can be read from visual reading devices E attached to the ends of the mass B. Both devices give the same reading, checking each other. The stress in the specimens is proportional to the amplitude within the range of Hooke's law. It can be directly figured from the readings on device E. If Hooke's law is exceeded, the exact determination of the stress has to be done by an additional static loading arrangement furnished with the machine. The pulleys I and some other weighing and measuring equipment not shown in the figure permit finding the actual stress-strain relation, thus eliminating the usual error, due to figuring the stress according to Hooke's law. This static weighing device also eliminates the errors based on the assumption that the clamps are rigid, since the amount of yield in the grips is measured in the static test.

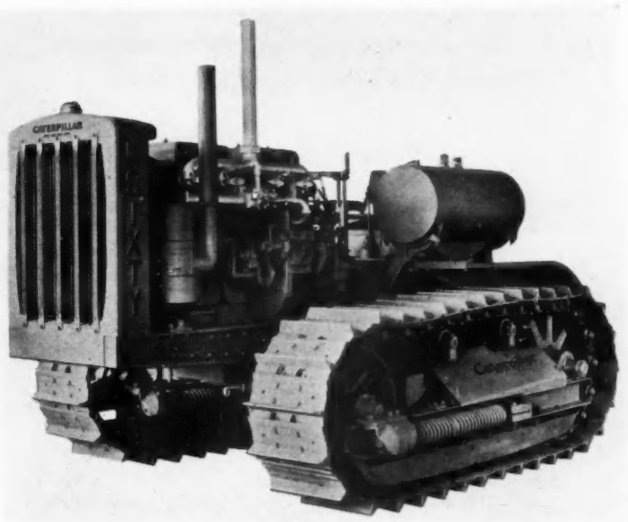
The outstanding feature of the machine is that the stress is constant over the full gage length of the specimen. The acceleration forces during the oscillation are pure moments. The center of gravity of all moving parts is stationary, so that a pair of accelerating forces is always generated. The stress distribution over the length is as uniform as the one in tensile specimens and the simple shape of the latter without reduced sections or tapers is readily applicable for fatigue tests on this machine. The failures are, therefore, not restricted to a certain part of the specimen, but occur where the weakest point of the material happens to be, thus revealing any lack of uniformity of the material tested. There is uniform stress distribution also in the static bending test.

The number of cycles is counted by an electrical counter H driven by a small synchronous motor in series with the pulsating current line feeding the electromagnets. As a matter of fact, the number of electric impulses is counted, which, however, is equal to the number of oscillations or stress cycles, due to the resonance principle applied. There is, furthermore, an automatic adjustable contact mechanism which stops the machine after a failure.

Diesel Tractor to Be Sold With Sealed Spare Injection Units

A DIESEL-ENGINED tractor, the Caterpillar Diesel Sixty, has been placed in production by the Caterpillar Tractor Co. of Peoria, Ill. In a general way its design is similar to that of the Caterpillar Sixty with gasoline engine, but a number of improvements or modifications have been made in parts of the running gear.

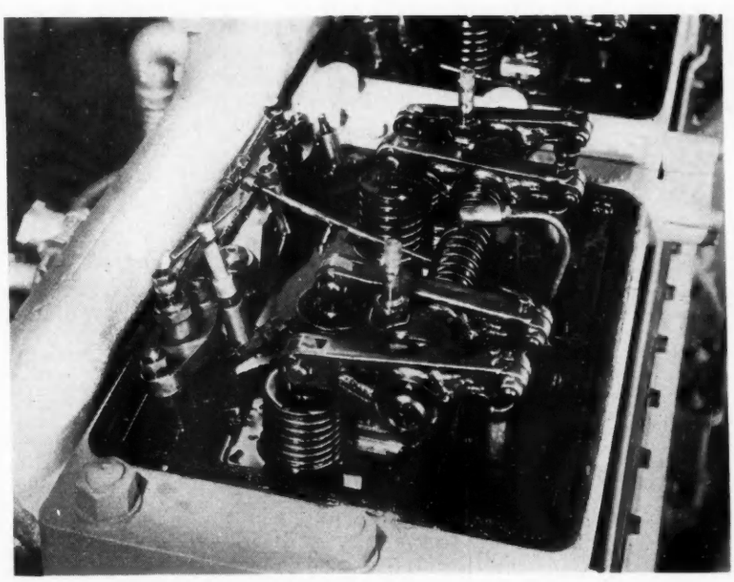
The engine, which is a four-cylinder, four-cycle type, was specially designed for use on tractors, and is being built in the shops of the Caterpillar Tractor Co. It is of the precombustion-chamber type, with a bore of 6⅛, and a stroke of 9¼ in., and the maximum horsepower is said to be 75 at the governed speed of 650 r.p.m. The displacement being 1090 cu. in., the b.m.e.p. figures out to 83.8 lb. per sq. in., while the piston speed corresponding to the governed engine speed is 1002 ft. per min.



Caterpillar Diesel Sixty, starter side

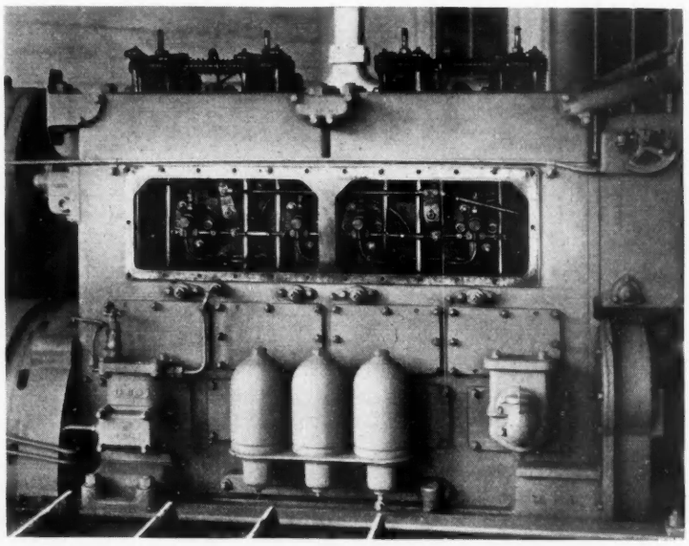
Bosch pumps and atomizers are used, but two deviations from customary practice have been made in the arrangement of the fuel injection mechanism. In the first place, an individual pump unit is provided for each cylinder, the unit being located at the side of the cylinder in the space through which rise the side rods for operating the overhead valves. Access to the pump units is obtained through two large openings provided with cover plates. The injector valves are bolted to the cylinder head and are protected by the valve cover. With each engine is furnished a complete set of interchangeable, sealed injection units (pumps and injector valves). Each of these units has been fully adjusted and tested at the factory on the particular engine with which it is sent out, so that the operator can substitute it for a corresponding unit that has developed faults without making any adjustments whatsoever. Much is expected from this plan of relieving unskilled operators of the necessity for tinkering with the fuel injection system.

Engine starting is by a small two-cylinder Caterpillar gasoline engine which engages the flywheel of the Diesel through a clutch and Bendix drive. The starting engine is started by means of a hand crank. It will be noticed from the illustrations that this engine occupies about the same position relative



Top view of cylinder head showing air and exhaust valves and injection nozzles

Caterpillar Diesel Sixty Tractor is powered by a four-cylinder, four-cycle type engine specially designed for use on tractors



Fuel pump chamber opened to show individual injection pumps and governor linkage

to the Diesel engine as the conventional electric starting motor. In explaining the choice of a gasoline engine for starting purposes, the company points out that an electric starter is inapplicable, owing to the undesirability of a storage battery on a tractor, and an air starter calls for a compressor and various other items of equipment, which add complication. An advantage of the gasoline engine starter is that it warms the air under the hood, thereby rendering starting positive in cold weather.

The engine operates on any fuel regularly sold for use in Diesel engines, and its consumption is said to be from 30 to 40 per cent less than that of a gasoline engine doing the same work. A supply of 55 gal. can be carried in the tank. Control of the Diesel tractor is the same as that of the standard gasoline tractor. The fuel pumps are of the type in which delivery is varied by rotating the pump plungers around their axes, and the racks by which this is accomplished are linked together and connected to a single control device convenient to the operator. The fuel consumption is given at 0.61 lb. per drawbar hp.-hr., and since 75 belt hp. corresponds to 63 drawbar hp. this would seem to make the consumption per belt hp.-hr. 0.51 lb.

Sectioned models of Bosch injection nozzle and pump unit

It is claimed that the precombustion-chamber type of Diesel has the advantage that the maximum combustion pressures are moderate, with the result that the loads on the engine bearings are kept down, and engine vibration is reduced. The exhaust gas temperature is said to be low, which is conducive to long life of the exhaust valves and their seats. The use of a single-orifice injector nozzle with an orifice diameter of 0.086 in. is said to practically eliminate trouble from choked nozzles. Such trouble is further guarded against by the provision of a two-stage fuel filter. The filter, which is mounted on the outside of the engine, is of limited capacity and requires periodical inspection and cleaning. Fuel is filtered under pressure due to a fuel supply pump. Air bubbles in the fuel lines are eliminated by suitable check valves.

The approximate shipping weight of this tractor is 25,000 lb. Three forward speeds are available, of 1.9, 2.6 and 3.7 m.p.h. respectively, and the maximum drawbar pulls corresponding to these speeds are 12,425, 9285 and 6470 lb.

There are several modifications in chassis parts from the standard Caterpillar Sixty. For instance, the frame side members are different, the radiator design has been modified, and a heavy equalizer spring is used instead of the equalizer bar. The tracks are of 34-in. section, and recoil springs are of the tandem type.

It has been decided to sell the Caterpillar Diesel Sixty for the present only for applications where intensive utilization is assured (day and night operation being preferred), and where the engines will be accessible to the factory staff. None will be sold outside the United States. The catalog price is $6,500.

Floyd Lubricants Tolerate Higher Unit-Area Loadings

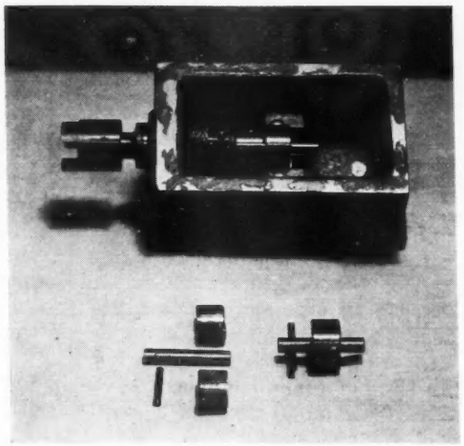


Fig. 1—Test box filled with specimen lubricant

Synthetic extra-pressure oils show no lapping effects on run-ins and normal oils used subsequently perform better

A LINE of synthetic lubricating oils capable of sustaining a protective oil film under several times the unit-area load of normal lubricating oils and a machine to test the load-carrying capacity of lubricants, have been developed by the Frank Harris Floyd Co., lubrication engineers, Detroit.

The extra-pressure oils are obtained by chemically combining normal mineral oils and a synthetic lubricating base also developed by the Floyd Company. The increased load ability is demonstrated by an oil-film test machine. The synthetic base seems to impart to the completed lubricant greater molecular strength and stability, and apparently lowers the viscosity ratio between 210 deg. and 100 deg.

The accompanying photographs show the machine primarily developed to provide a comparison of the new lubricants with existing oils. A machine different in appearance and in method of loading, lighter, and more compact, is being prepared to offer for sale. While the illustration shows a mechanical design, the new machine will be hydraulically loaded.

Fig. 1 shows the test-box filled with the specimen lubricant. For each test a small steel shaft is placed between two steel bushing halves, with a shear-pin attaching the shaft to the driving unit. The latter is driven through gear reduction from a synchronous electric motor. Load is supplied gradually through compound leverage on the upper bushing half, in this case through the addition of weights (see Fig. 2). By standardizing the rate of application of additional weights, the total number of weights carried is a criterion of the oil film strength before seizure of the shaft in the bushing halves and shearing of the pin, terminating the test.

Ordinary heavy transmission and axle lubricants carry from four to eight weights before failure of the oil film occurs. The same oil treated with the Floyd base will cary sixteen weights before failure. Sulphur in stable combination seems to be a major constituent of the base. Free sulphur, however, does not seem to be present, judging from the non-corrosive characteristics of Floyd's treated oils.

While there is no evidence of abrasive or lapping action in oils treated with the Floyd base, new equipment originally lubricated with the new compounds apparently will carry higher loads later, with customary oils. This is regarded as particularly important for the running-in of parts having close fits on which temporary overloads might occur, or on parts having imperfect finish of working faces.

The Floyd Company claim that the flat viscosity characteristic enables the use of single all-weather lubricants for axles and transmissions. Also taking advantage of this characteristic a particularly interesting line of lubricants has been developed as shown in the accompanying table. They are intended specifically for free-wheeling units, although they have applications in many other units of the modern automobile. The lower four lines in the table indicate the temperatures of the lubricant at the viscosities variously assumed by different free-wheeling manufacturers, to be critical for the operation of their free-wheeling mechanisms.

As an indication of what can be accomplished in

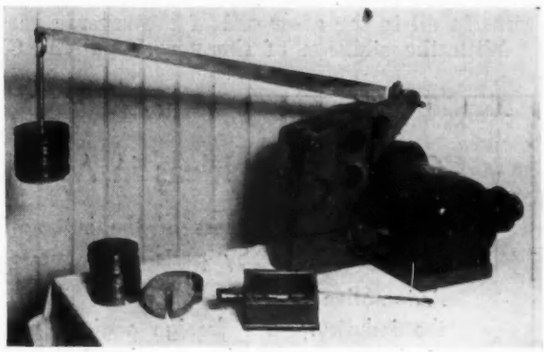


Fig. 2—Shows method of applying load gradually with leverage

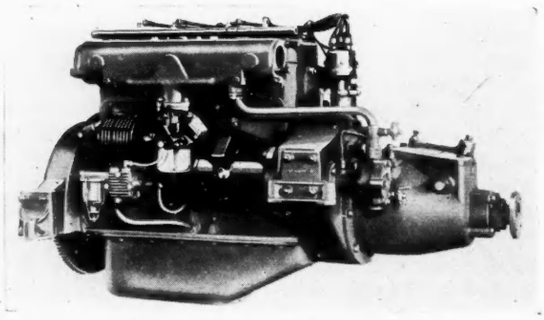
providing extra-pressure lubricants for heavily-loaded bus or truck transmission gears and for double reduction or worm-driven axles, several lubricants having unusual features are given, as follows:

Vis. @ 210°	Vis. @ 100°	Pour
150 sec.	1900 sec.	plus 10 deg.
175 sec.	2975 sec.	plus 5 deg.
200 sec.	3300 sec.	plus 5 deg.

A normal steam cylinder stock having a viscosity of 200 sec. at 210 deg. will run about 6500 sec. @ 100 deg. will have a pour-point of about 30 deg. above zero.

Rubber Mounting Used On Chrysler Marine Engine

A NEW Chrysler Regal marine engine has been announced by the Amplex Mfg. Co., division of the Chrysler Corp. It is of the four-cylinder type with cylinders and crankcase cast integral. The bore is 3⅝ in. and the stroke 4¾ in., which makes the displacement 196 cu. in. At 1600 r.p.m. the Regal develops 35 hp. and at 2800 r.p.m. 55 hp., according to the manufacturer. One of the features of the engine is the use of a rubber-cushioned mounting, which requires no changes in the conventional type of engine bed.



Chrysler Regal marine engine

The Regal engine is equipped with a reverse gear of Chrysler design and manufacture. The "ahead" clutch consists of dry disks. Reverse action is provided through a contracting bank acting on the periphery of the clutch drum. An inspection hole is provided in the reverse gearcase, permitting easy access for making "ahead" adjustment. The reverse adjustment is on the outside. A thrust bearing of the ball type runs in oil in the after end of the reverse gear.

With the addition of the new Regal the Chrysler line of marine engines, which ranges in size up to 150 hp. Majestic, has been further extended. The price of the Regal engine is $395.

Stutz Insulates Automobile Bodies

IN its 1932 models the Stutz Motor Car Co. has made every possible effort to make the driver and passengers comfortable, physically and mentally. One of the outstanding features of the new DV-32 and SV-16 models is the fact that the bodies are insulated against heat and cold and deadened against the admission, origin or transfer of noise.

The entire inside of the body, including wooden framework and metal panels, is sprayed with an emulsion of asphaltum and asbestos. This dries to form a layer approximately ¼ in. thick of a material whose conductivity of both heat and noise is very low. In addition to its insulating qualities this material fills up interstices between the framework and panels, as well as between different parts of the framework, which might, in the course of time result in body squeaks. It also dampens any tendency toward vibration in the metal panels and thus prevents resonance and drumming. This same emulsion is sprayed over the passenger side of the dash and also the under side of the floor boards.

In addition to the sprayed-on insulation, the inside or passenger side of the metal body dash is fitted with a 5/16 in. layer of soft texture fibre composition board. This board not only absorbs low frequency noises which would otherwise be transmitted to the passenger compartment, but also has a high coefficient of heat insulation and thus serves to keep down the temperature of the driving compartment. Over the top of this insulating board is fitted a cardboard finishing mat covered with imitation leather to match the cowl points. Where tubes and cables come through this finishing mat, rubber grommets are fitted to seal the clearance openings and preclude the transfer of heat and noise from the motor compartment.

On the engine side of the dash is installed a similar soft texture fibre board. Over this is fitted a ⅛ in. asbestos mill board. This asbestos board not only serves as a deadener of high frequency sounds and heat insulator but also as a fire protection wall.

Floor and toe boards which are sprayed underneath with the plastic material are covered on the upper side with a 5/16 in. soft insulating fibre mat. The mat joints are staggered with the joints in the floor boards so that they do not coincide at any point. This overlapping of the joints forms an insulating seal. The mats also act as noise dampeners. Openings around the gearshift and emergency brake levers are closed with a tightly fitting flat rubber mat to prevent the ingress of air and noise.

Gadgets Are Ideas in Metal

The abounding success of the automotive industry has been due largely to the vigorous flood of ideas developed by parts and accessory companies.

Automotive Industries offers the most complete coverage of this tremendously important phase of the industry. Our foreign engineering staff writers, our Detroit field editor and home office technical men prepare for you descriptions of the latest parts and accessory developments every week.

PRODUCTION LINES

Safety First

"Showing consistent improvement over a period of the last three years, the safety program of the Lycoming Manufacturing Co., of Williamsport, has won for this company a rating of fourth place among gray iron foundries of the nation. The contest participated in by 46 gray iron foundries last year was conducted by the National Safety Council. A clear record in July was established for the United States Aluminum Co., at New Kensington, its fifth no-accident month out of the last twelve. This record was achieved with 3500 employees."—*From Labor and Industry, Commonwealth of Pennsylvania, October, 1931.*

Diogenes' Lantern

We have been about seeking information which would show how progressive companies keep their equipment up-to-date. Here's a simple plan that has attracted favorable comment. Mr. Cornell, general supt. of this company (name on request), says:

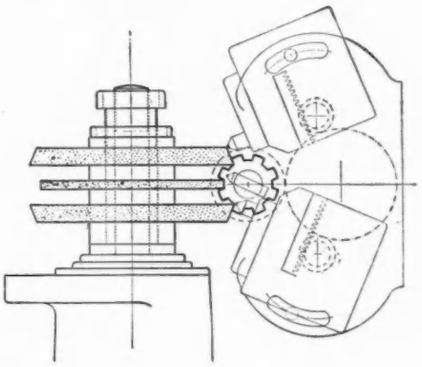
"As general superintendent, I go almost daily into our shops. If a machine is under repair today and I see it again next week, I find out why.

"Regularly I obtain from our cost department the exact amount of time and materials used for repairs, operators' lost time, etc. I study these reports, compare with production costs and with my shop observations, depending on no one source alone. I cultivate acquaintance with machine tool representatives; I discuss with them, frankly, our production problems.

"To sum up, our policy holds that there is no systematized program that provides a satisfactory equivalent for intimate, personal supervision. A practical man, with manufacturing experience or background, can, from these three outlooks, determine when to discard, when to repair, when to change, when to replace; he can, with an administrative board which has faith in his observation, study and judgment, maintain the manufacturing equipment constantly in such condition and content that production is obtained at a maximum economy and suited to the requirements."

Triple Truing

Splineshaft grinding is simplified by a method recently devised by the Churchill Machine Tool Co., Ltd., Manchester, Eng. The process is



triple truing, using three wheels. Thus, sides and radius are ground simultaneously as shown. The secret lies in the use of a truing device consisting of three diamonds properly located in relation to the work. This constitutes the automatic sizing feature. Wheels and diamonds may be adjusted for six or eight splines.

Synthetically Speaking

Have you considered what a sizable industry is that of making synthetic ammonia (NH_3)? According to the duPont magazine for December, 1931, the total investment in plant in this country is estimated at $70,000,000. Approximate output in 1930 was 140,000 tons. It's interesting to learn that the synthetic product is a most economical source of hydrogen and nitrogen. A dissociator is now made by duPont which will crack ammonia into hydrogen and nitrogen right in your plant.

Think of It

Out of the reclamation of steel rails an industry was born. This is one of the latest activities of the Republic Steel Corp. Rail carbon steel, rolled flat, formed, and electrically welded by an exclusive process, produces tubing. The latter method is the basis of the products made by Steel and Tubes, Inc., described in detail in a booklet, Republic Rail Steel Products. It's full of interesting engineering dope.

Industrial Relations

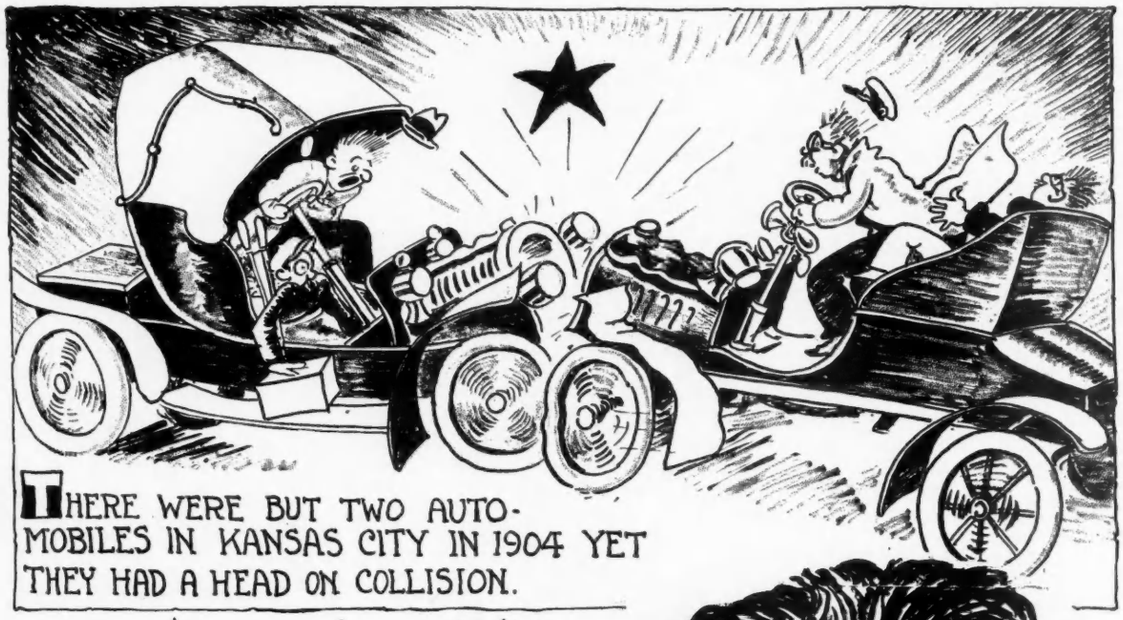
A program of industrial relations, evolved by the Westinghouse Electric & Mfg. Co., was recently adjudged the nation's best and drew a capital award. Among other features their plan includes a relief fund, a trusted savings fund, a group insurance plan, and an incentive plan for executive and supervisory force. The total cost to the company has averaged $1,938,352 per annum.

Cleaning Aluminum

According to "The New Houghton Line" for December, 1931, Houghto-Clean is mighty fine stuff for cleaning aluminum. "In water solutions at temperatures ranging from 180 deg. to 212 deg. Fahr. (83 deg. to 100 deg. C.) these cleaners will remove oils, grease, and fats from aluminum. Any degree of concentration may be used without danger of injuring aluminum or aluminum alloys. With concentrations as low as four ounces per gallon of water, heavy dirt accumulations are quickly removed."—J.G.

MANUFACTURING MANAGEMENT METALLURGY

Automotive Oddities—By Pete Keenan



THERE WERE BUT TWO AUTOMOBILES IN KANSAS CITY IN 1904 YET THEY HAD A HEAD ON COLLISION.

Pete Keenan

There are poor people in the Tennessee mountains who live in such dilapidated shacks that every time it rains they have to go out and get into the sedan.

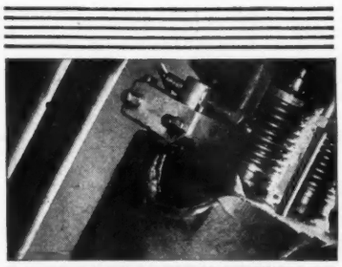
"LASSIE" HAS TRAVELLED 700,000 MILES BY AUTOMOBILE Belongs to Jack Graham.

ALTHOUGH IT WEIGHS BUT 50.1lbs. INVENTOR ROY MEYERS CLAIMS THAT HIS COMPRESSED AIR AUTOMOBILE MOTOR WILL DEVELOP 100 H.P. AND DRIVE A CAR 1000 MILES ON ONE CHARGE OF AIR

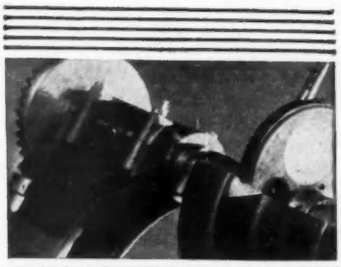
ANIZO BALBONI— CRASHED INTO THE **JUNK** BUSINESS. Wrecking a plane while stunt flying. He sold it piece by piece. From this he developed his business, and is said to be the only airplane Junkman in the world. San Diego. Cal.

Do You Know An "Oddity"?

Correspondence about "Automotive Oddities" is invited. Contributions used will receive editorial mention when practicable. If you are interested in the source of, or the reason for, a particular "Oddity," ask the editorial department of Automotive Industries about it.



NEWS OF THE INDUSTRY



Michigan Sales Drop Slightly

Ford Leads in Home State

DETROIT, Dec. 22—Passenger car registrations in the State of Michigan during November totaled 3416, a decrease of six per cent from the October figure of 3636 and a decrease of 19 per cent from the November, 1930, figure of 4201. The Ford figure for November was 942, a decrease of nine per cent from October Ford total of 1040 and a decrease of 38 per cent from the November, 1930, figure of 1538. Chevrolet was second with 823, Buick third with 319, Plymouth fourth with 267, Pontiac fifth with 131, and Essex sixth with 112.

Commercial car registrations totaled 543 in November as against 684 in October and 840 in November last year. Ford was first with 265, Chevrolet second with 150 and International third with 37.

Oakland Under Way

DETROIT, Dec. 22—New model production now is under way at the Oakland Motor Car Co. with full-time shifts. It is reported that the 1932 cars may be announced slightly before the New York Automobile Show. There will be two lines of cars, a six and a V-8. Both models offer synchromesh transmission with quiet second gear and built-in free wheeling as standard equipment at no extra cost.

Peters Leaves Nash

NEW YORK, Dec. 22—A. C. Peters, for the past three and a half years export sales promotion manager of the Nash Motors Co., has announced his resignation. Mr. Peters has also been connected in the past with Packard as sales and advertising manager. He has made no definite plans for the future.

WHEN a Chicago policeman saw the letters 2477 C.F.L. on the license plate of a speeding car he was dumfounded. The car was yellow and imported and stepping along a busy street. He gave chase and found it belonged to Princess M'Dvani, or Mary McCormic, of the Chicago Civic Opera. The license was from Paris, but the chauffeur got a ticket anyway.

Chevrolet Motor Co. employees have given over $1,000 to the Chicago jobless relief fund. Bendix Aviation just turned in $5,000.

Chicago motorists are for county police everywhere now. They have been stopped as they approached Dixmoor by county officers who warn them of a speed trap in that village.

From elsewhere come these milestones on the path of motorization: A Medford, Mass., dog doesn't cry over spilt milk. He was sunning himself on the curb recently when a motor truck appeared. The driver swerved to avoid hitting the pup and wrecked his truck, spilling 800 quarts of milk on the street. The dog drank his fill and waddled away.

Frank Hawks, speed flier, was a victim of slow motion in New York recently. Drawing to a stop in his car, a taxicab backed into it.

From Mourmelon-le-Grand, Marne, comes word of real peril in motoring. Five wild boars attacked a party of five motorists (one apiece), charging the car. The driver plowed into the boars, running atop of three. They almost upset the car getting out from under. One was caught, another fatally injured and the other three and the five motorists escaped uninjured.

Another stickler for the clan of the peepul's representatives on Capitol Hill, D. C., who are contemplating a motor vehicle excise tax: States and local tax districts are taking from the average motorist and truck operator about four times as much in revenue as these same authorities took from the private and public motorist 10 years ago. The motor industry has not seriously resisted gasoline taxes which went into more highways for more cars, but an excise tax to balance the national budget is something different.

Richard H. Scott, president of the Reo Motor Car Co., was among the first to congratulate D. E. Eddins on the new Oldsmobile products.

THE NEWS TRAILER

G. M. Narrows A Sales Group

Charlotte Office Will Handle Several Lines

CHARLOTTE, N. C., Dec. 24—Establishment of a zone headquarters in Charlotte for the new division which will have general supervision over sales of several lines of General Motors Corp. automobiles was forecast in reports published here. The effective date for the new set-up was given as Jan. 1.

General headquarters for the new division in the Southeast will be established at Atlanta, the reports said.

Under the new plan, contacts with dealers in General Motors lines except the Chevrolet line will be made by sales supervisors of the new division's staff. This organization is being formed as an economy measure by which duplication of travel and other expense by supervisors representing individual lines can be eliminated, the reports explained.

General Motors Corp. now holds the Buick building here under a long term lease. In this five-story structure uptown will be stored reserve stocks of the corporation's product. Buick, Chevrolet, Frigidaire and GM-AC divisions already have zone headquarters in Charlotte.

M.E.A. Opposes Tax

NEW YORK, Dec. 22—Members of the Motor & Equipment Association have been called upon to get in touch with their congressmen to urge the defeat of any discriminatory taxation directed toward the automobile industry and those industries serving it. This is in line with the action already taken by the National Automobile Chamber of Commerce as announced at the time that Secretary of the Treasury Mellon delivered his message suggesting an increase of taxes to meet the present fiscal emergency in the Government.

Faulkner Joins Studebaker; Is Vice-President of New Sales Unit

SOUTH BEND, IND., Dec. 23— R. H. Faulkner, former Auburn president, has become vice-president of Studebaker Sales Corp. of America. The announcement of Mr. Faulkner's appointment was made here today by Paul G. Hoffman, president of the company, and A. R. Erskine, president of the Studebaker Corp.

The appointment marks the going to Studebaker of one of the most experienced and successful executives in the automotive industry. Endowed with a personality of exceptional vigor and warmth, Mr. Faulkner has combined with these qualities a keen sense of practical business necessities through which he has built a record of continuous success.

Prior to becoming president of Auburn Automobile Co. in February, 1931, Mr. Faulkner had been vice-president of that company during the years of its rapid growth. He was sales manager of Auburn at the time E. L. Cord took charge of Auburn in 1924.

Mr. Faulkner has spent almost his entire business life in the automobile industry, largely in sales work. After a few years as county recorder at the Allegheny court house in Pittsburgh and as salesman with the West Pennsylvania Lumber Co., he first came into the automobile business as a retail salesman for the Oakland Motor Co. of Pittsburgh. Next he became sales manager for the Reo and Stutz dealer in the same city and later moved to Cincinnati as manager of the retail branch of the Frank Santry Motor Co., Nash distributors. In the fall of 1922 he went to Auburn Automobile Co. as sales manager. He is 45 years of age.

R. H. Faulkner

Mr. Faulkner enters Studebaker at a time when that corporation is inaugurating a number of new subsidiaries (as indicated in the article on pages 976-979 of this issue) and thus takes his place alongside the others of the group of younger executives in that organization upon whom Mr. Erskine has been placing heavier and more important responsibilities each year.

Keller Made Sales Manager

George B. Keller has been named sales manager of Studebaker Sales Corp. of America, Paul G. Hoffman, president of that company, stated today following his announcement of the appointment of R. H. Faulkner as vice-president. Mr. Keller has held positions of responsibility in Studebaker Corp. for several years.

To Discuss Tariff

NEW YORK, Dec. 23—The export committee of the National Automobile Chamber of Commerce will hold a meeting on Jan. 12, at which export managers will be invited to be present to discuss the advisability of a bargaining tariff as a policy of the automobile industry.

For definite recommendations to the directors who will meet the following day, the proposed discussion will consider the question of whether such a policy should assume flexible form, or should be all-inclusive, constituting a single blanket rate on all the products of a certain country.

It will also consider the advisability of establishing a non-political body of experts, appointed by leading trade and business associations, to determine what tariff treaties will be best suited for different countries to assure national well-being rather than emphasizing sectional interests.

Develop Automatic Choke

SOUTH BEND, Dec. 21—A device which automatically opens and closes the choke valve in accordance with the temperature in the vicinity of the carburetor has been developed by the Bendix-Stromberg Carburetor Company. It consists of a thermostat of the bimetallic type which is enclosed in a housing installed adjacent to the carburetor. The thermostat spring closes the choke valve, and at temperatures below 70 deg. the valve is fully closed. When the temperature rises above this point the choke begins to open, until at 120 deg. and over it is wide open. One well-known make of car has adopted this automatic choke for both of its 1932 models.

Hanch Fortifies Discount Case

Says Banks Could Have Been Saved With Time-Sales Paper

CHICAGO, Dec. 22—Despite the fact that most banks rediscount in the Federal Reserve System only a small portion of the paper they hold, which is admissible under the law, many would have been saved from failure if they had had more eligible securities, according to C. C. Hanch, general manager of the National Association of Finance Companies, who pointed out today that finance companies' notes held by banks in normal times average approximately a total of $1,200,000,000.

If all this paper were eligible to rediscount at the Federal Reserve banks, there would still be a deficiency of rediscountable paper as compared with 1920, Mr. Hanch contends. However, this increase in eligible paper would have an important and desirable effect upon the condition of the banks in the country.

"The amount of eligible paper created by American business transactions has been decreasing since 1920," said Mr. Hanch. "At the end of 1920, eligible paper in the possession of banks who were members of the Federal Reserve System was approximately $6,458,000,000, but on June 30, of this year, it had decreased to $3,198,000,000.

"This decrease was brought about by the changes in business methods which could not have been contemplated by the framers of the Federal Reserve Act. One of the business changes which has brought about this condition is the acquisition by large business concerns of large amounts of working capital so that they no longer have to borrow from banks in order to carry on their affairs.

"The proposition to make finance company paper eligible to rediscount is not inflation because it does not contemplate the creation of any new credit. It is merely a proposition to make certain paper, which banks already have in their portfolios, more useful to them as a readily realizable reserve in case of need. Most of this paper would never be rediscounted, but it would be there in case of emergency."

Brosseau Tells Advisory Board That Shippers Will Choose Transportation Which Serves Best

NEW YORK, Dec. 21—Transportation is a commodity, and it will be sold by the agency—whether rail, highway, water or air—which best suits the customer, A. J. Brosseau, president of the Mack Trucks, Inc., and vice-president of the National Automobile Chamber of Commerce, told members of the Atlantic States Shippers Advisory Board, last week.

Speaking on "How Can Trucks and Rails Best Serve Transportation Needs," Mr. Brosseau asserted that the shipper will use the form of service which serves him best. "Neither the railroad man nor the truck manufacturer will decide how transportation services will be developed," the speaker declared.

Likening the railroad to a factory which produces transportation, Mr. Brosseau complimented the rail carriers on the production of "the best long-distance land transportation the world has ever seen."

Mr. Brosseau said that railroad equipment is not adapted to handle less-than-carload traffic which clutters terminals and interferes with traffic on the line.

"American railroad statistics for 1930," said Mr. Brosseau, "show that 26 per cent of the cars loaded with revenue freight were used to carry the l.c.l. freight which was only 2.6 per cent of the total tonnage and which returned only 10 per cent of the total freight revenue.

"As an industrialist," he continued, "I have no hesitancy in saying that no manufacturer can prosper if he devotes 26 per cent of his factory capacity to sell 2.5 per cent of his goods at a price high enough to amount to 10 per cent of his gross business—if his customers can buy merchandise from some other manufacturer at a lower price."

Comparing the independence of truck operation to the monopolistic position of the railroads, Mr. Brosseau pointed out that the 3,500,000 trucks of the country are owned by 2,500,000 individuals, of whom 2,200,000 own one truck each. On the other hand 15 railroad systems control 85 per cent of the railroad mileage of the country.

In an analysis of the reasons shippers use trucks, Mr. Brosseau quoted a recent study made by Yale University covering the shipping situation between New York and Philadelphia in which it was disclosed that the impelling reason for the use of truck service was overnight delivery from the producer's plant to the consignee's door.

"Store-door delivery, rush service and lessened loss and damage were the next most important reasons," Mr. Brosseau said. "In other words the first element in the use of a motor truck is convenience.

"The truck is, and always will be, an individual unit of transportation. It is adaptable, it can go anywhere, anytime at a moment's notice. It is not and never will be a system of transportation comparable to the rail."

Mr. Brosseau explained that the long-distance movement by truck was the exception, not the rule, and will remain so. One exception, he explained, was the moving of furniture, where the saving in crating, handling and damages, justifies a long truck trip.

Mr. Brosseau declared that excessive taxation and undue regulation of the common and contract carrier trucks, would result in shippers buying their own equipment. The only result of the elimination of contract and common carrier trucks he said will be to "penalize the small shipper who will not be able to give his customers a service similar to that of his competitors who operate trucks. In no event will the traffic go back to the rails.

Answering charges that the commercial motor vehicles are not paying their fair share for the cost of highways, Mr. Brosseau stated that trucks and buses, though comprising but 12 per cent of all motor vehicles, are paying 27 per cent of all motor vehicle taxes.

33 Exhibitors Enter Aero Show

National Event Signs 15 More for April 2-10

DETROIT, Dec. 21—Entry of 15 new exhibitors in the National Aircraft Show of 1932, to be held here next April 2 to 10, was announced today by Ray Cooper, manager of the show, which will be sponsored by the Aeronautical Chamber of Commerce of America, Inc.

The new entries, Mr. Cooper said, comprise two airplane manufacturers and 13 concerns devoted exclusively to accessories. They bring the total number of exhibitors thus far entered to 33, which 33, nearly four months in advance of the show opening, have contracted for approximately one-half of the total exhibition space available.

Detroit City Airport will be the scene of the exposition, general arrangements for which are in the hands of a board of control, headed by William B. Mayo, chief engineer, Ford Motor Co., and a member of the chamber's show committee:

The entire entry list follows:

AUTOGIROS

Pitcairn Aircraft, Inc., Willow Grove, Pa.

AIRPLANES

Waco Aircraft Co., Troy
Great Lakes Aircraft Corp., Cleveland
Stinson Aircraft Corp., Wayne, Mich.
Ford Motor Co., Dearborn, Mich.
Curtiss-Wright Corp., New York
Bellanca Aircraft Corp., Newcastle, Del.
Nicholas-Beazley Airplane Mfg. Co., Marshall, Mo.
American Airplane & Engine Corp., Farmingdale, L. I., N. Y.
Chance Vought Corp., Hartford, Conn.
Kellett Aircraft Corp., Philadelphia

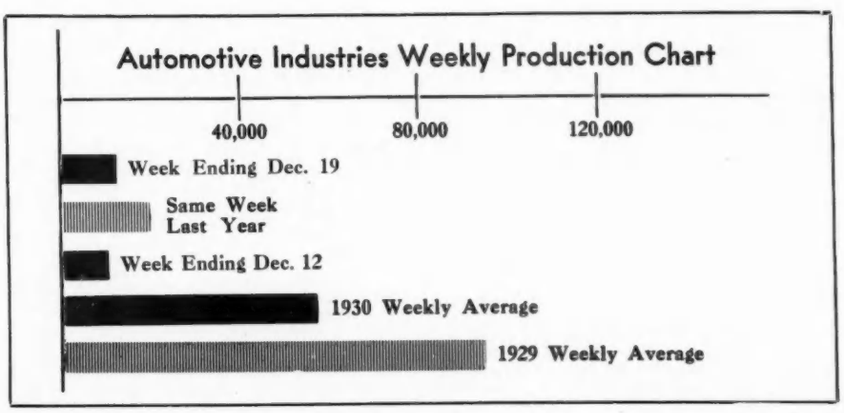
ACCESSORIES

Irving Air Chute Co., Buffalo
Champion Spark Plug Co., Toledo
Kendall Refining Co., Bradford, Pa.
Macwhyte Co., Kenosha, Wis.
Cleveland Pneumatic Tool Co., Cleveland
Hill Aircraft Streamliners Co., Cincinnati
Timken Roller Bearing Co., Canton, Ohio
Berry Brothers, Inc., Detroit
Standard Oil Co. of Indiana, Chicago
General Electric Co., Schenectady
Packard Motor Car Co., Detroit
Curtiss-Wright Flying Service, New York
The B. G. Corp., New York
Elgin National Watch Co., Elgin, Ill.
John Roebling's Sons Co., Trenton, N. J.
Western Electric Co., New York
Wright Aeronautical Corp., Paterson, N. J.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Edo Aircraft Corp., College Point, L. I., N. Y.
Pratt & Whitney Aircraft Co., Hartford, Conn.
Hamilton Standard Propeller Corp., Hartford, Conn.

AIR LINE

United Airlines, Chicago

Sparks-Withington Co. has announced that renewal of its contract with the Hupp Motor Car Co. for horn equipment for another year represents the fifteenth consecutive year that Sparton horns have been used by Hupp.



Men of the Industry and What They Are Doing

H. S. Johnson Heads Gisholt

Hobart S. Johnson, formerly vice-president of the Gisholt Machine Co., Madison, Wis., has been elected president to fill the vacancy caused by the death of his brother, Carl A. Johnson. Three new vice-presidents have been chosen, namely, Fred W. Coombs, George Johnson and Charles H. Johnson. G. E. Gernon, secretary, and M. I. Johnson, treasurer, have been reelected.

Ross Leaves Rolls-Royce

Austin C. Ross has resigned as works manager of Rolls-Royce of America, Inc., at Springfield, Mass., and will conclude his duties Jan. 1 to be connected with the Worthington Pump & Machinery Corp., New York, where he will be associated again with Harry C. Beaver, former Rolls-Royce treasurer and now president of Worthington. Mr. Ross has been connected with Rolls-Royce 12 years. His duties will be taken over by Henry S. Keyes, treasurer of the company.

Selden Joins Budd

Cass E. Selden, formerly vice-president of the Ainsworth Mfg. Co., will become associated with the Edward G. Budd Mfg. Co. and the Budd Wheel Co. on Jan. 1. Mr. Selden was formerly president of Joseph M. Smith Co., which concern was consolidated with the Ainsworth Mfg. Co. in 1929. He will be located in Detroit.

Jones Moves to Chicago

Edwin G. Jones, for the past six years general superintendent of the Inland Steel Co. of Wisconsin, has been transferred to the Chicago offices, following the closing of the Milwaukee sheet rolling mills for an indefinite period after a long time of slack and interrupted production. Mr. Jones assumes new duties Jan. 1 in the inspection and metallurgical department of Inland headquarters.

Lining Group Elects

At a recent meeting of the Asbestos Brake Lining Association held at the Ambassador Hotel, Atlantic City, the following officers for 1932 were elected:

William Brookes, Ferodo Asbestos Co., president; F. R. Lee, Thermoid Rubber Co., first vice-president; D. L. Taylor, Russell Mfg. Co., second vice-president; W. J. Parker, Commissioner of the Association.

Seaman Heads Fund

Irving Seaman, secretary-treasurer of the Seaman Body Corp., Milwaukee, has been elected president of the Milwaukee County Community Fund. He has been vice-president for two terms. Mr. Seaman was especially active in the annual fund campaign in October, which resulted in a subscription of $1,325,000 for the local charities budget, or more than 6 per cent above the quota.

Advocates Discretion On Road Fund Use

WASHINGTON, Dec. 22—The Federal road appropriation should not be increased, but discretionary authority over the allocation of appropriations should exist, according to a report of the Committee on Program of Federal Public Works. The report of the committee, made to Walter S. Gifford, director of the President's Organization on Unemployment Relief, says that since 1928 about $1,500,000,000 has been spent annually on road construction throughout the country, of which the Federal government has appropriated $125,000,000 each year. A similar amount, it is stated, is budgeted for 1932.

"In considering the relation of these expenditures to present unemployment," said the committee, "the real question is not the need of more money but rather the expenditure of money at places where an emergency may exist. To be of maximum advantage in the present situation the allocation of road appropriation should be discretionary instead of being fixed by law."

Ask Receiver for Moon

WILMINGTON, DEL., Dec. 22—A petition of involuntary bankruptcy has been filed against the Moon Motor Car Co., of St. Louis, but a Delaware corporation, in the United States district court in Wilmington. The petition was filed by Ivin Culbertson, Wilmington lawyer, representing three petitioners: Philadelphia - Moon, Inc., which alleges a claim of $26,392 against the St. Louis organization; Charles W. Haller of Pennsylvania, who claims $40; and Howard Brion, of Philadelphia, who claims $11.50. Conley T. Santman, of Philadelphia-Moon, Messrs. Haller and Brown signed the petition.

It is alleged in the petition that the Moon Motor Car Co. committed an act of bankruptcy when it permitted the appointment of a receiver in the U. S. circuit court of St. Louis, Nov. 16, 1930. On or before Jan. 6, 1932, the Moon Motor Car Co. must show cause, in the Wilmington court, why an action of involuntary bankruptcy should not be continued.

Olds Shows New Lines

Lansing Dealers Get Pre-View of 1932 Models

LANSING, MICH., Dec. 23—Dealers here are giving a "pre-showing" of the 1932 line of Oldsmobile cars. Although the list prices have not been announced by the factory, it was broadly hinted here that prices will be under the 1931 levels.

The cars have a longer wheelbase, have free wheeling and are equipped with ride control. An option of an eight-cylinder engine is offered at about $100 more than the corresponding six-cylinder body model.

The eight is designed along the lines of the six-cylinder engine. It has a piston displacement of 240 cu. in., and will develop 82 hp. at 3350 r.p.m. It has a dual down-draft carburetor.

The six-cylinder engine has been increased from 197.5 to 213.3 cu. in., developing 71 hp. at 3200 r.p.m. Thermostatic control of the inlet manifold temperature and an automatic choke are provided. It is fitted with a new carburetor and a new manifold. Valves on both the six and the eight are larger, and both are fitted with oil coolers.

The fuel line is so carried around in front of the engine away from the exhaust, to protect against overheating the line and vapor-lock. The capacity of the radiator has been increased 3¼ qts. being now 16¼ qts.

The company is stressing a new type of engine mounting used on the eight and six lines this year. The front of the powerplant is supported on angles of about 25 deg. from the horizontal, and the rear is supported on biscuit-type supports on the frame cross member. This type of mounting permits setting the engine at an angle for an approximately straight-line drive to the rear axle under load.

Axles have been increased in strength, and the frame is somewhat stiffer and heavier.

The bodies have a windshield slope of 10 deg. Pillar angle is 7 deg.

Budd Payroll Up

PHILADELPHIA, Dec. 21—The payroll of the Edward G. Budd Mfg. Co. in January will total approximately $800,000, as against an expenditure of $429,000 for the corresponding period of 1931, according to estimates made following a meeting of the company's directors.

Recent International Class Speed Records

(Recognized by the International Association of Recognized Automobile Clubs)

Record Distance or Time	Start	Date	Place	Sponsor	Driver	Make of Car	No. of Cylinders	Bore	Stroke	Displacement in C. C.	Time or Distance Run H. M. S. 1/100	Speed in Kilometers	Speed in M.P.H.
					WORLD RECORDS								
4,000 M.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	42 h. 33′ 57″ 87	151.232	93.97
48 H.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	7.292 k. 069	151.918	94.40
					INTERNATIONAL RECORDS								
					Class E								
2,000 K.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	13 h. 05′ 03″ 84	152.854	94.98
2,000 M.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	20 h. 49′ 29″ 07	154.560	96.04
3,000 K.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	19 h. 26′ 25″ 73	154.317	95.89
3,000 M.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	31 h. 48′ 00″ 66	151.824	94.34
4,000 K.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	26 h. 30′ 38″ 02	150.883	93.75
4,000 M	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	42 h. 33′ 57″ 87	151.232	93.97
5,000 K.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	33 h. 06′ 28″ 97	151.021	93.84
6 H.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	940 k. 300	156.717	97.38
12 H.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	1.872 k. 469	156.039	96.96
24 H.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	3.703 k. 489	154.312	95.88
48 H.	S	Nov. 28-30	Montlhery	Benoist	Chinetti, Pesato et Zehender	Alfa-Romeo	6	65	88	1752.6	7.292 k. 069	151.918	94.40
					Class I								
50 M.	S	Nov. 17	Montlhery	R. von Koenig-Fachsenfeld	R. von Koenig-Fachsenfeld	Voran	2	68	68	494	38′ 48″ 19	124.423	77.31
100 K.	S	Nov. 17	Montlhery	R. von Koenig-Fachsenfeld	R. von Koenig-Fachsenfeld	Voran	2	68	68	494	48′ 36″ 55	123.434	76.70
					Class J								
200 K.	S	Nov. 18	Montlhery	R. von Koenig-Fachsenfeld	R. von Koenig-Fachsenfeld	Voran	2	58.7	64.2	347 5	1 h. 58′ 29″ 66	101.271	62.93

K—Kilometer(s) M—Mile(s) S—Standing start

New York Adds to Autocar Fleet

PHILADELPHIA, Dec. 23—Autocar Co. received an order from the Sanitary Commission of New York City for 162 heavy-duty truck chassis at a cost of $486,000.

This is the second large order received by that company from the Sanitary Commission in the present year, the earlier order being for 205 trucks. With the new purchase New York City will have a fleet of 445 Autocars.

The trucks just ordered are to be equipped with bodies for street flushing. The order provides that delivery begin within 60 days and be complete within a period of four months.

Lycoming Adds 1000 Workers

WILLIAMSPORT, PA., Dec. 21—Approximately 1000 employees have been added to the payroll of the Lycoming Mfg. Co. within the last 10 days, it was announced here today. About 55 per cent of these employees have been added in the foundry division, and the remainder in the machine shops and assembly departments. Practically all departments are working on a full six-day week with night shifts in several departments.

Canadian Highways Cost $900,000,000

OTTAWA, ONT., Dec. 23—Canada's investment in highways is said to total $900,000,000 covering roads estimated at 390,000 miles in length.

Tourist traffic from 1924 to 1930 brought $1,600,000,000 to the Dominion. Ontario's provincial treasurer is authority for the statement that motor tourist traffic revenue of Ontario pays a 100 per cent dividend annually on Ontario's total investment in highways.

The Canadian Section of the Society of Automotive Engineers states that revenue from motor vehicles in Canada, including registration and gasoline tax, totaled $41,076,405 in 1930, an increase of $1,745,103, or 4.3 per cent over the previous year.

Mileage Tax Doomed

JASPER, FLA., Dec. 22—Circuit Judge M. C. Horne has ruled unconstitutional the 1931 legislative act that sought to levy a mileage tax on trucks operated under private contract.

Effect of Traffic To Be Studied

BOSTON, Dec. 21—A nation-wide study of the relation between street traffic and trade will be undertaken during the coming year by the Albert Russell Erskine Bureau for Street Traffic Research, according to an announcement made today.

Arthur R. Burnet of the Association of National Advertisers has been appointed as Erskine fellow to conduct the research under Dr. McClintock's direction. The investigation has been made possible through a special gift to Harvard University by the Outdoor Advertising Association of America and by the Association of National Advertisers.

Seek to Open Rubber Plant

OAKVILLE, ONT., Dec. 23—Reopening of the tire factory formerly owned and occupied by the Royal Oak Tire Corp., and the possible employment of a large number of men, is being delayed only by lack of power and water on account of a $900 liability incurred by the defunct Royal Oak firm for a minimum service rate over a considerable period after the plant had closed down, it was brought out at an Oakville council meeting.

The plant is said to represent an investment of over $200,000, and at capacity employed 120 men.

It has been lying idle for about five years. In addition to tires, a variety of other rubber products will be manufactured.

Detroit Gear Orders Renewed

CHICAGO, Dec. 21—Current reports of the Detroit Gear & Machine Co., division of Borg-Warner Corp., reveal that all of its equipment parts contracts with large automobile companies have been renewed for the coming year. It also has received orders for transmissions and two for free-wheeling equipment. This was stated today by C. S. Davis, president of the parent corporation. This month the Detroit Gear & Machine Co. will introduce three free-wheeling models and one new transmission.

Directs Electric Sales

Sam J. Green has been appointed sales director of the Sante Fe Electric Co., Inc., Newark, N. J. Mr. Green was formerly connected with Moto Meter Co. as New England representative.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, Dec. 23—Retail trade last week was better than at any other time during this year; but, of course, the improvement was mostly the result of holiday buying. The volume of holiday trade is reported to be as good as last year, but measured in terms of the dollar it is below that a year ago. Cheap and moderate priced goods have been in demand the most. As is usual toward the end of December, wholesale activity is below its recent levels.

ELECTRICITY PRODUCTION

Production of electricity by the electric light and power industry during the week ended Dec. 12 was 4.4 per cent below that a year ago.

CONSTRUCTION AWARDS

Construction contracts awarded in 37 Eastern States during November amounted to $151,195,900, as against $253,573,700 a year ago. The total for the first 11 months of this year was $2,955,997,900, as compared with $4,273,679,100 in the corresponding period last year.

CAR LOADINGS

Railway freight loadings during the week ended Dec. 5 totaled 636,366 cars, which marks a decrease of 150,706 cars below those a year ago and a decrease of 296,943 cars below those two years ago.

MERCHANDISE EXPORTS

Merchandise exports during November amounted to $193,000,000, as against $288,978,000 during the corresponding period last year, while imports totaled $150,000,000, as against $203,593,000.

VALUE OF FARM PRODUCTS

According to a report of the Department of Agriculture, the total of all agricultural products in 1931 is placed at $4,122,850,000, as compared with $5,818,820,000 in 1930 and $8,088,494,000 in 1929.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended Dec. 19 stood at 67.0, as against 67.1 the week before and 67.6 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended Dec. 16 were 27 per cent below those a year ago.

STOCK MARKET

The stock market during most of last week suffered further declines. The testimony of Thomas W. Lamont before the Banking Committee of the Senate regarding Germany and foreign loans was interpreted favorably, and on Friday a sharp rally in both stock and bond prices took place. Trading was on a comparatively large scale. Several issues showed large net gains for the week, while some closed a bit below the openings a week earlier.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended Dec. 19 showed decreases of $27,000,000 in holdings of discounted bills and of $82,000,000 in holdings of bills bought in the open market. Holdings of Government securities increased $189,000,000. The reserve ratio on Dec. 16 was 65.0 per cent, as against 66.1 per cent a week earlier and 65.6 per cent two weeks earlier.

Tests New Aero Injection Engine

EAST HARTFORD, CONN., Dec. 21—Dynamometer and flight tests have been completed on a new Hornet aircraft engine, manufactured by the Pratt & Whitney Aircraft Company of this city, in which gasoline is injected directly into the engine cylinders instead of being mixed with air in a carburetor and the mixture then drawn into the engine. An engine of this type has been installed on a Boeing 40-B-4 mail plane on the Boeing division of the United Air lines for the purpose of determining its behavior under service conditions.

The Hornet equipped with this system of mechanical fuel injection develops 525 hp., and with the exception of the fuel-distributing system is practically identical with the Series A-2 Hornet. It is claimed that by the direct injection of gasoline the hazards of cold-weather operation are overcome, that perfect operation is assured regardless of atmospheric temperature, that cold starting is greatly facilitated, and that the difficulty previously encountered with ice formation in the carburetor in winter operation is eliminated.

Curtiss Gets Army Order

NEW YORK, Dec. 21—Curtiss Aeroplane & Motor Co. has received orders from the U. S. Army Air Corps for 46 pursuit planes of the P6E Hawk type. This plane is the fastest standard pursuit plane built and has a top speed of 197 miles, and a cruising speed of 160 m.p.h. This plane is basically the same as the P6 type except that refinements have increased the performance qualities with reductions in weight and head resistance.

Characteristics: Span, 31 ft., 6 in.; high speed, 197 m.p.h.; landing speed, 63.4 m.p.h.; length, 23 ft., 1 in.; cruising speed, 160 m.p.h.; rate of climb, 2100 ft. per min.; absolute ceiling, 26,500 ft. Curtiss Conqueror, Prestone cooled, 650 horsepower direct drive. Three blade propeller. Landing gear, single strut type; tail wheel steerable with rudder; cockpit lined with micarta; gasoline capacity 50 gallons; gasoline auxiliary capacity, 50 gallons.

F.W.D. Near Peak

CLINTONVILLE, Wis., Dec. 21—The biggest commercial backlog in the history of the Four Wheel Drive Auto Co. is reported by Walter A. Olen, president, as the result of booking a number of large orders.

In the past, orders from the U. S. Army have served to roll up a larger backlog than the present one, but this consists almost entirely of commercial business.

The payroll now is 700, compared with an all-time peak of 750. Two shifts are working.

Rockne Names 50 Travelers

District Men Now Placed in Most Sections of U. S.

DETROIT, Dec. 21—Supplementing its permanent staff in Detroit, and the recently opened export office in Paris, the Rockne Motors Corp. has announced the names of 50 representatives who will make dealer contacts and get the Rockne lines under way in almost every section of the United States. The names of the representatives, with the cities where they will make their headquarters, follow:

Name	City
W. L. Ackerman	Longmeadow, Mass.
R. P. Baker	Minneapolis
G. E. Cherryman	Grand Rapids
Maurice E. Collmer	South Bend
Walter E. Delfel	Seattle
Emory S. Egge	Montgomery, Ala.
H. A. Greer	Denver
Gresham, R. O.	Kansas City, Mo.
J. W. Guenther	Cleveland
John R. Haines	Frostburg, Md.
Ardery Hudgens	San Francisco
C. H. Jordan	Boston
H. E. Kaufman	Chicago
W. O. Leonard	Cleveland
T. Mulford Lesher	Philadelpha, Pa.
Stanley D. Leuty	Cleveland
Geo. S. Linthicum	Baltimore
James Lyons	Detroit
Donald F. McVey	New York
E. K. Polson	Indianola, Iowa
E. A. Steninger	Dallas
H. J. Stevenson	Buffalo
C. H. Ward	San Antonio
H. H. Wilton	Tulsa
H. D. Worcester	Newport, Ky.
Edgar Bisch	Pittsburgh
Sid Black	Cleveland
R. C. Brown	Dallas
W. H. Barnett	Detroit
W. L. Charlton	Minneapolis
Wm. H. Clemens	Buffalo
Jas. S. Daley	Atlanta
C. H. Domville	Chicago
Allan A. Floyd	Boston
H. C. Fralick	Detroit
Harrison Goldsmith	Chicago
John H. Gordon	Los Angeles
Melville Hunt	New York
L. P. Kilbourne	New York
E. M. Knoff	Memphis
L. M. Montania	Denver
A. F. Myers	Seattle
F. C. Poole	Kansas City, Mo.
H. P. Rude	Philadelphia
C. J. Shahan	Omaha
C. J. Shaffer	Washington
H. J. Shorter	Philadelphia
Geo. Stroman	Detroit
B. M. Taft	Atlanta
F. A. Thomas	San Francisco

Fitzjohn Reorganized

MUSKEGON, MICH., Dec. 22—The Fitzjohn Body Co. has been formed to take over from a receiver all assets of the Fitzjohn Mfg. Co. Manufacture of bus bodies will be continued by the new organization, with F. W. Feeney as manager, and Harold Begley in charge of manufacturing. Both men were associated with the Fitzjohn Mfg. Co. The new organization is expected to announce new models within a short time.

Citroen Earnings Rise

Citroen Motor Works, French automobile manufacturer, announces net earnings for the fiscal year ended June 30 last as fr. 33,827,000, as against fr. 31,784,000. The dividends are maintained at fr. 40 on the "B" and fr. 35 on the "A" shares."

New Deoxidine Designed for Brushing

Progress has been made recently in the welding and soldering of metal. As a result, the requirements for chemical cleaners have changed. The fabricated parts reach the cleaning department so much freer from rust than they did formerly, that new Deoxidines have been developed for the changed conditions. One of these is the pigmented dry cleaning Deoxidine which is applied by spraying. The coating is dried in an oven and then removed. The resulting surface is free from oil, slightly etched, and in excellent condition to receive lacquer or synthetic undercoats.

As a further improvement in the cleaning operation, a new type of Deoxidine has been developed for those surfaces which are now cleaned more or less successfully with oleum spirits, gasolene, thinners, etc. The surfaces are, of necessity, free from rust. However, if rust be present, it must be removed with the wet cleaning Deoxidine, and rust stimulators from soldering acid must have been counteracted immediately after soldering.

The new Deoxidine is a concentrated material known as "Deoxidine No. 304," and manufactured by the American Chemical Paint Co., Ambler, Pa. The concentrate is diluted with eight volumes of oleum spirits and thoroughly stirred. This Deoxidine-spirit solution is applied as though it were oleum spirits. Brushes are usually used for the purpose, particularly where the products are of irregular shape and where dried paint is to be removed. The surface is immediately wiped with clean rags before the solution evaporates. The work is then allowed to air dry for 15 or 20 min. and the primer is then applied.

This new Deoxidine development should be of interest in whatever cleaning operations petroleum fractions, thinners, alcohol, etc., are now being used. The removal of oil and paint is said to be as complete as that produced by these, and in addition, hand marks and extremely thin coatings of rust will be destroyed, so that defects will not develop in the finishes.

Standardization Being Pushed

NEW YORK, Dec. 21—Investigation and study as to what can be done with regard to greater dimensional standardization and interchangeability of major parts is being actively prosecuted by the Motor Transport Advisory Committee of the Society of Automotive Engineers, in association with the Quartermaster Corps of the U. S. Army.

This investigation is being made at the request of General John L. DeWitt, Quartermaster General, with whom the Advisory Committee is cooperating in order that the industry may know what the Army wants in this regard.

Tractor School is Success

MILKAUKEE, Dec. 21—More than 650 people from all parts of Wisconsin, including several county highway commissioners and assistants, and dealers, mechanics and operators, attended the annual tractor school conducted here by the Drott Tractor Co., distributor of Allis-Chalmers tractors.

The object of the school is to show operators how to handle their machines and make field repairs and adjustment. There also were practical demonstrations of magneto adjustment, electric and acetylene welding, carburetor adjustments, etc.

This was the seventh annual session of the school, the first of which brought about 40 together.

Prepares Safety Bulletin

NEW YORK, Dec. 21—American Petroleum Institute, Department of Accident Prevention, has prepared a new "Manual on Safe Driving of Automobiles." This manual is designed primarily to promote highway morale among drivers or oil company fleet vehicles.

British Goodrich Profits

LONDON, Dec. 11 *(by mail)*—Net profits of the British Goodrich Rubber Co. for the year ending Sept. 30 amounted to $366,660 (at par) compared with $440,620 for the previous year, not a serious drop in view of general trade conditions and when calculated on a capital basis of $5,645,000. The Ordinary dividend is maintained at 5 per cent and $225,000 is transferred to reserves, bringing total reserves up to $350,000. The amount placed to reserve in 1930 was only $125,000, but the directors regarded the strengthening of the company's financial position essential.

Doubles Payroll As Orders Gain

MILWAUKEE, Dec. 21—As the result of new orders for bumpers, metal tire covers, etc., the Federal Pressed Steel Co. has been able to increase its shop payroll more than 100 per cent in the past 30 days and is operating 6½ days a week, with two departments maintaining a night shift. The present schedule will be justified until the latter part of January by orders already booked, according to Frederick Hansen, general manager.

Effect of Traffic On Trade Sought

NEW YORK, Dec. 21—The Albert Russell Erskine Bureau for Street Traffic Research is planning a nationwide study of the relation between street traffic and local trade.

Dr. Miller McClintock, director of the bureau, points out that while a great deal has been done in the study of urban trade under the name of market research, and much attention has been given to the analysis of traffic volume, little has been done to consolidate these two factors and properly evaluate them.

Ask Control of Transportation

CALGARY, ALTA., Dec. 17—Unification of the Canadian National and Canadian Pacific Railways, commission control of motorbus and truck traffic were urged here yesterday at a public session of the Royal Commission on railways and transportation.

Marmon Motor Car Co. has made arrangements for a permanent showing of its 16-cylinder car in connection with the Isotta-Fraschini in New York. Capt. Hugo V. D'Annunzio, head of the Isotta organization in New York, will handle sales of both cars.

Automotive Industry Stocks Have Total Market Value of $1,787,691,069

NAME OF GROUP	COMMON STOCKS					PREFERRED STOCKS					ALL STOCKS				
	No. of Companies	No. of Issues	Average Price	Total Shares Listed	Total Market Value	No. of Issues	Average Price	Total Shares Listed	Total Market Value	No. of Issues	Average Price	Total Shares Listed	Total Market Value
Automobile & Truck Mfg. Co.'s (and Holding Co.'s)	23	23	$16.52	83,740,384	$1,383,795,989	7	$78.78	2,364,475	$186,267,240	30	$18.23	86,104,859	$1,570,063,229
Automobile Access. Mfg. Co.'s (and Holding Co's)	35	35	9.36	22,259,189	208,296,417	5	31.38	297,409	9,331,423	40	9.65	22,556,598	217,627,840
AUTOMOBILE INDUSTRY .....TOTAL	58	58	15.02	105,999,573	1,592,092,406	12	73.48	2,661,884	195,598,663	70	16.45	108,661,457	1,787,691,069
FARM MACHINERY INDUSTRY.TOTAL	7	6	20.51	8,086,516	165,889,461	5	40.91	3,142,150	128,529,700	11	26.22	11,228,666	294,419,161
Petroleum & Natural Gas Co.'s	42	44	14.43	169,063,878	2,438,920,282	12	39.79	2,215,962	88,179,230	56	14.75	171,279,840	2,527,099,512
Petroleum & Natural Gas Holdings Co.'s..	3	3	5.86	3,505,961	20,561,710	..	....	.....	.....	3	5.86	3,505,961	20,561,710
PETROLEUM INDUSTRY .....TOTAL	45	47	14.25	172,569,839	2,459,481,992	12	39.79	2,215,962	88,179,230	59	14.58	174,785,801	2,547,661,222
AIRPLANES-A'WAYS-A'PORTS..TOTAL	9	9	6.35	16,476,541	104,685,573	2	10.39	1,380,433	14,348,528	11	6.67	17,856,974	119,034,101
Omnibus Operating Co.'s	3	3	6.17	1,085,261	6,691,653	1	55.00	88,813	4,884,715	4	9.86	1,174,074	11,576,368
RUBBER TIRE & GOODS INDUSTRY .....TOTAL	8	8	8.37	9,622,836	77,688,389	10	35.95	2,661,097	95,660,466	18	14.11	12,283,933	173,348,855

Chilton Factory List Shows Relatively Few Personnel Changes

PHILADELPHIA, Dec. 23—Despite the disturbing influences of the present business conditions, the automotive industry's executive personnel has demonstrated more than ordinary stability during 1931.

The November, 1931, issue of the Chilton Factory List, just published, shows fewer changes in motor vehicle, aircraft and engine company executives than did several previous editions. A total of 4141 changes in personnel or titles were made during the year.

More than 7200 names are listed, with titles, in the Factory List. These are arranged by location and companies. The company headings are passenger car and taxicab, motor truck, bus, tractor, motorcycle, motor boat, aircraft, engines and industrial equipment.

More than 1000 changes were made during the year in companies added, dropped, names and addresses changed, etc.

Changes in Companies Listed in Chilton Factory List

November, 1930, to November, 1931

Type of Company	Added	Dropped	Name Changed	Address Changed	Other Changes	Total Changes
Automobiles	9	6	7	15	54	91
Commercial Vehicles	18	22	5	13	86	144
Buses	10	10	1	6	20	47
Tractors	5	7	1	1	48	62
Motor Boats	33	8	5	8	57	111
Aircraft	46	81	12	25	156	320
Engines	39	35	7	19	120	220
Industrial Equipment	15	19	6	16	184	240
NET TOTALS	147	164	39	81	623	1054

Changes in Executives Listed in Chilton Factory List

November, 1930, to November, 1931

Title of Executive	Automobiles	Motor Truck	Bus	Tractor	Motorcycles	Motor Boat	Aircraft	Engines	Industrial Equip.	Totals
President	12	23	7	16	...	10	36	32	37	134
Vice-Pres.	45	63	26	38	...	14	74	60	79	311
Secretary	20	25	10	15	...	14	57	43	43	187
Treasurer	21	31	7	12	...	14	65	42	48	190
Gen. Mgr.	46	51	11	9	...	14	51	39	50	208
Works Mgr.	27	37	7	16	1	14	32	41	52	176
Supt.	38	54	14	17	...	11	37	44	58	215
Prod. Mgr.	18	25	10	6	1	9	31	27	34	127
Prod. Engr.	3	7	3	1	...	4	3	5	7	29
Pur. Agt.	38	56	12	14	1	19	49	43	46	218
Asst. Pur. Agt.	11	19	8	5	1	1	16	16	16	70
Service Mgr.	42	57	13	10	1	6	14	22	22	130
Engineer	35	49	16	17	1	10	68	59	65	264
Body Engr.	11	9	4	1	...	...	1	1	3	24
Tool Engr.	6	5	2	2	...	2	6	8	10	33
Tool Supt.	7	6	3	...	...	...	3	3	6	20
Foundry Supt.	4	2	2	4	...	...	1	10	16	33
Pl. Maint. Engr.	19	21	4	3	...	2	5	4	8	43
Body Shop Supt.	17	22	9	1	...	2	...	1	1	32
Trim Shop Supt.	7	8	4	1	...	2	1	2	1	17
Mch. Shop Supt.	12	14	4	1	...	5	11	21	16	65
Paint Shop Supt.	7	16	5	4	1	8	15	6	9	55
Drop Forge Supt.	2	1	1	...	...	...	1	...	3	6
Metallurgist	4	2	1	2	...	...	1	5	8	18
Sales Mgr.	98	102	32	32	1	20	50	76	91	356
Adv. Mgr.	29	38	16	16	...	12	37	50	53	194
Other Officers	165	115	28	27	...	9	65	64	72	389
NET TOTALS	670	753	238	257	7	158	625	655	778	4141

British Columbia Seeks 7-Cent Gasoline Tax

VANCOUVER, B. C., Dec. 22—Increase in the gasoline tax is likely to be made by the British Columbia government, in spite of the opposition being voiced by highway, tourist and automobile organizations.

The government now levies a tax of five cents a gallon which brings in an annual revenue of approximately $1,800,000. An additional one-cent tax would increase this revenue by $360,000, but it is unlikely that the government would make any change in the levy unless it effected an increase of at least two cents, representing an advance in revenue of $720,000. The government will also take steps to definitely establish the legality of this tax, of which there has always been some doubt.

Producing Tire Covers

WATERLOO, IOWA, Dec. 21—The Hinson Mfg. Co. has begun production on contract for a large order of tire covers for the Chevrolet Motor Co. The covers, it is said, will meet requirements for the first half of 1932. The Hinson firm began manufacture of advertising tire covers in 1930 and has had several large contracts from Ford and Chevrolet.

Four Automobile Plants in Saxony Merge Under Government Auspices

by Edwin P. A. Heinze

BERLIN, Dec. 8 (*by mail*)—Although no official confirmation has been received, there is no doubt that an important merger of the automobile industry in the German federal state of Saxony, has been accomplished. The factories concerned are Zschopauer Motorenwerke (DKW), Horch, Wanderer and Audi, of which the first mentioned and Audi have already been affiliated for some time. The merger is to take effect from Jan. 1, 1932, and the leading company will be the Zschopauer Motorenwerke.

The DKW combine comprises a number of factories producing automotive equipment, pedal cycles, Diesel engines and refrigerators, besides the central concern engaged in the manufacture of two-stroke motorcycles of many models and two-stroke motor cars of a very popular type. The refrigerator company is to become independent, with DKW retaining 49 per cent of the share capital. It is also to take over the production of the Diesel engines, for the manufacture of which DKW acquired Junkers rights this year. This, however, does not include rights to manufacture automotive type Diesel engines, which are being produced exclusively in Germany by the Junkers company.

The DKW combine was reorganized financially in 1929 when its capital was raised from 1,000,000 marks to 10,000,000 marks ($2,380,000) with the aid of the Saxon Government.

The Saxon Government has also aided the Horch company when it was in difficulties and planned combining it with a South German factory. Audi last year became an adjunct of DKW, which, in acquiring interest in this concern, saw an opportunity for divesting itself of a stock of Rickenbacker engines it had come in possession of by the well-known transaction in 1929. Audi and Horch produce exclusively high-class cars. The former company, however, under DKW control last year, entered the small car field by fitting Peugeot engines into DKW chassis, formerly equipped with two-stroke DKW engines and which were offered as Audi small cars without meeting the sales success that was anticipated. As manufacturer and seller Horch has been much more successful than Audi, having built up a splendid reputation abroad so that a large percentage of the production was exported. Besides the Saxon Government also the Commerz-und Privat-Bank as also the Adca bank are interested in this company.

While these three concerns have thus for some time been more or less under the control of the Saxon Government, the Wanderer company remained independent of this influence. It produces not only motor cars, but also machine tools, typewriters and pedal cycles. The motorcycle production was given up to NSU last year.

The desire of the Saxon Government to consolidate its automotive interests and of gaining control of the entire Saxon automobile industry was for a long time frustrated by the terms demanded by Wanderer, to include which enterprise in the planned combine was considered essential, as it would have been a formidable outsider with car models that exactly fit into the range of models the other combine works are producing. An agreement has now been made, it is understood, on the basis of Wanderer selling its motor car manufacturing rights to the new combine and giving a five years' lease of its motor car factory at Siegmar. The selling price will be paid in the shape of a packet of shares of the new DKW holding company to be organized with a capital of 15,000,000 marks ($3,575,000). The new company will have between 4,000,000 and 5,000,000 marks accounts due, about 14,000,000 marks assets in the shape of materials in stock and about 15,000,000 marks in debts. An influx of new cash working-capital is assured by the I. G. Farben combine having promised to take 1,500,000 marks' worth of shares.

The new combine is expected to achieve an annual turnover of 65,000,000 marks ($15,400,000), based on a calculation of 26,000,000 ($6,200,000) by DKW, 15,000,000 marks by Wanderer, 16,000,000 marks by Horch and 3,000,000 marks by Audi. Its production range covers every type and class of motor car from the cheap small car to the luxurious 12-cylinder Horch and numerous popular motorcycle models. The factories are situated all in one neighborhood, offering considerable advantages for cooperation.

Spent $85,000,000 in 1930

OTTAWA, ONT., Dec. 23—During 1930, $85,729,272 was spent in the construction and maintenance of Canadian highways, exclusive of local roads receiving no provincial subsidy, and urban streets, according to figures contained in the annual report for 1930, "The Highway and Motor Vehicle in Canada."

This report was issued today by Dominion Bureau of Statistics. During the year additional expenditures on bridges and ferries brought the total for highways, bridges and ferries to $93,101,050.

The outstanding provincial debt for highways at the end of the year totaled approximately $326,659,000.

At the end of the year there were 80,498 miles of surfaced highway in Canada and 397,373 miles of all classes of highway, Ontario had the greatest mileage of surfaced highway, 44,740 miles, or 55 per cent of the total. Quebec was second and British Columbia third with 13,302 and 7,477 miles respectively. There were 1,239,888 motor vehicles registered, all provinces with the exception of Saskatchewan showing an increase over 1929.

The report shows that 1290 persons were killed in motor vehicle accidents and on the basis of gasoline consumption Saskatchewan had the lowest record with 1632 deaths per 70,000 motor vehicle miles while New Brunswick had the highest rate, 5149 deaths per 70,000 motor vehicle miles.

Budd Wheel Declares

PHILADELPHIA, Dec. 22—At a meeting of directors of the Budd Wheel Co., the regular quarterly dividend of 1¾ per cent, with an extra dividend of ¾ of one per cent per share, was declared on the 7 per cent first preferred stock of the company, payable Dec. 31 to holders of record on Dec. 28, 1931. The board decided against the payment of the common dividend for the fourth quarter in view of the fact that substantial dividend payments have already been made during the past year, amounting to 75 cents per share on the common stock, and in order to maintain a strong working capital position.

Overland Names Betts

William E. Betts, who began his automotive career with Willys-Overland 15 years ago, has joined the company again as sales promotion manager and already is functioning in his new position. For the past year Mr. Betts has been regional manager for Studebaker, with headquarters in Los Angeles.

Canadian Buick to Build Own Bodies

OSHAWA, ONT., Dec. 23—H. A. Brown, vice-president and general manager of General Motors of Canada, Ltd., announces that all Buick bodies formerly manufactured in the United States will now be manufactured here.

The company's action in this respect is the result of Government regulations restricting the importation of body sheet metal.

Gabriel Buys Kari-Keen

SIOUX CITY, Ia., Dec. 21—The Gabriel Co., Cleveland, has purchased the Kari-Keen Mfg. and Irving Engineering companies of this city, at the receiver's sale last week on its bid of $110,000, which has been approved by the court. John J. Batterman, vice-president and treasurer, was here to complete the transfer and announced that the company expects to reopen the plant the first of the year.

Woodin Succeeds Sale

At a meeting of the directors of the American Car and Foundry Motors Co., C. S. Sales resigned as president of the company and W. H. Woodin was elected president.

Bauer Returns From Far East

NEW YORK, Dec. 22—There is a world-wide demand for the use and purchase of automobiles which is awaiting the resumption of the normal exchange of commodities, in the opinion of George F. Bauer, manager of the Export Division of the National Automobile Chamber of Commerce, who returned recently from a seven months' trip through the Far East.

As soon as normal commercial operations are resumed, Mr. Bauer feels that this demand will take care of even a larger production than that witnessed in 1929.

Taking up specifically the countries which Mr. Bauer visited, he found in Japan a very universal recognition of the function of the motor vehicle in the transportation of persons and products. This country is at present hampered, however, by the fact that in addition to a high import duty, local taxes make private ownership of an automobile virtually prohibitive. Furthermore, while Japan has a greater mileage of roads in proportion to its area than has the United States, these roads are not fitted for the use of motor vehicles and there is a crying need for a concerted program of highway improvement and bridge building.

During the course of his lectures in Japan, Mr. Bauer advocated that motor vehicle taxes be set aside in a special fund to be used in the amortization of bonds for proper paving of the highways, instead of being turned into the general treasury as is now the case.

Conditions in China, Mr. Bauer found somewhat different from those in Japan and he felt that in order to assure an active road construction program necessary for the development of the motor market, the building of highways should be done on a contract basis. There is also a greater need for the encouragement of individually owned transport lines and motor vehicles in place of the government sanctioned lines now widely in operation.

Siam, while a small market and one that will never purchase motor vehicles to the extent that some of the larger nations will, is in a sound position financially and recognizes the virtue of motor transportation. This country is at present engaging upon a program of building dirt roads throughout the Kingdom for the encouragement of motor transportation.

India, because of the political situation and also because of the exchange situation, is at present not in a position to buy largely of motor vehicles, but here as elsewhere is felt the need of adequate transportation facilities which is only awaiting the readjustment of the attitude of the world toward the proper exchange of commodities.

Bunting Brass & Bronze Co. has opened new branch offices and warehouses in Seattle, Wash., and Detroit, Mich. The Detroit office is located at 447 E. Fort Street.

+ + CALENDAR + + OF COMING EVENTS

SHOWS

Buenos Aires, S. A., Automobile.Dec. 18-27
National Automobile, New York..Jan. 9-16
San Francisco, Automobile.....Jan. 9-16
Lansing, Mich., Automobile ...Jan. 11-16
Flint, Mich., Automobile .....Jan. 13-16
Newark, N. J., Automobile.....Jan. 16-23
Omaha, Neb., Automobile.....Jan. 16-23
Toledo, Ohio, Automobile.....Jan. 16-22
Cincinnati, Automobile .....Jan. 17-23
Milwaukee, Wis., Automobile...Jan. 17-23
Philadelphia, Automobile .....Jan. 18-23
Louisville, Ky., Automobile....Jan. 18-23
Columbus, Ohio, Automobile ...Jan. 23-28
Boston, Mass., Automobile.....Jan. 23-30
Minneapolis, Minn., Automobile.Jan. 23-30
Hartford, Conn., Automobile...Jan. 23-30
Detroit, Automobile .....Jan. 23-30
Montreal, Automobile .....Jan. 23-30
Baltimore, Automobile .....Jan. 23-30
Pittsburgh, Pa., Automobile...Jan. 23-30
Portland, Ore., Automobile.....Jan. 23-30
Springfield, Mass., Automobile..Jan. 25-30
Harrisburg, Pa., Automobile...Jan. 25-30
Seattle, Wash., Automobile.....Jan. 25-30
St. Petersburg, Fla., Automobile, Jan. 27-29
National Automobile, Chicago, Jan. 30-Feb. 6
Salon, Chicago .....Jan. 30-Feb. 6
Washington, D. C., Automobile Jan. 30-Feb. 6
Cleveland, Automobile ....Jan. 30-Feb. 6
Springfield, Ill., Automobile.....Feb. 4-6
Plainfield, N. J., Automobile.....Feb. 6-13
St. Paul, Minn., Automobile ....Feb. 6-13
St. Louis, Automobile.....Feb. 7-13
Denver, Colo., Automobile.....Feb. 8-13
Indianapolis, Ind., Automobile..Feb. 13-19
Salon, Los Angeles, Calif.....Feb. 13-20
Kansas City, Automobile.....Feb. 13-20
Mankato, Minn., Automobile...Feb. 17-20
Peoria, Ill., Automobile.....Feb. 17-21
Holyoke, Mass., Automobile...Feb. 18-22
Des Moines, Iowa, Automobile..Feb. 21-26
Wichita, Kan., Tractor and Power Equipment .....**Feb. 23-26**
Salon, San Francisco, Calif..Feb. 27-Mar. 5
Albany, N. Y., Automobile..Feb. 27-Mar. 5
Berne, Switzerland, Automobile.Mar. 11-20
National Aircraft, Detroit, Mich..Apr. 2-10

CONVENTIONS

American Roadbuilders Association, Detroit, Mich. .....Jan. 11-14, 1932
S.A.E. Annual Dinner, New York City, Jan. 14
S.A.E. Annual Meeting, Detroit, Mich., Jan. 25-29

Payrolls Up In Michigan

DETROIT, Dec. 21—Employment in the automotive industry in Michigan during November totaled 118,200, against 109,203 during October and 169,299 in November of 1930. Aggregate weekly payroll was $3,437,212 in November, $3,379,010 in October and $2,737,410 in November, 1930. Average weekly earnings, per capita, were $29.08 for November, $30.94 for October and $16.17 for November, 1930.

Oregon S.A.E. Meets

PORTLAND, Dec. 21—Oregon section of the Society of Automotive Engineers had its December meeting on the fourth in the Hotel Multnomah, starting with a dinner. Motion pictures of a working display of electric brakes were shown. S. C. Schwarz, chemical engineer, spoke on "Mineral Lubricating Oils — Their Production, Properties and Reclamation," and Lew Russell of the Consolidated Freight Lines on "Safety in Truck Transportation."

Overseas Club to Meet

NEW YORK, Dec. 21—The Overseas Automotive Club will hold its show meeting at the Hotel Astor on Thursday, Jan. 14, at 12.15 p. m.

Notes

Deaths from automobile accidents during the four weeks ending Nov. 28 in 82 large cities of the United States numbered 819. This figure compares with 811 deaths during the four weeks ended Nov. 29, 1930. Figures are reported by the Bureau of Census.

Canadian airway operators numbered five on Dec. 1. These companies were operating 16 regular air services with a total route length of 5454 miles. The figures indicate a reduction since March 1 of this year, when 11 companies were operating 26 scheduled services totaling 7426 miles in length.

Failure of the Fiat deal in Bogota, Colombia, removed the last vestige of European competition from the Colombian automobile market, according to the Automotive Division, Department of Commerce. European motorcycles, however, continue to dominate the country.

NEW YORK SHOW WEEK EVENTS

Automobile Merchants Assoc., Dinner, Commodore, 6.30..Jan. 8
International Registration, NACC offices, 10.30 a.m.....Jan. 9
Studebaker Corp., Dinner, Commodore, 6.30 p.m.....Jan. 9
Rubber Manufacturers Assoc. Meeting, Waldorf, 10.30 a.m. Jan. 11
Reception of Overseas Guests, NACC offices, 11.30 a.m...Jan. 11
Olds Motor Co., Dealer Meeting, Waldorf, 11.30 a.m.....Jan. 11
International Luncheon, NACC offices, 12.30 noon.....Jan. 11
Hudson Motor Car Co., Dealer Luncheon, Commodore, 12.30 Jan. 11
Hupp Motor Car Corp., Dealer Luncheon, Commodore, 1 p.m. Jan. 11
International Trade Conference, NACC offices, 2.00 p.m...Jan. 11
Metropolitan (SAE) Section Dinner, Commodore, 6.30 p.m. Jan. 11
Auburn Automobile Co., Dealer Luncheon, Commodore, 12.30 Jan. 12
Hudson Motor Car Co., Dealer Luncheon, Commodore, 12.30 Jan. 12
Olds Motor Co., Dealer Meeting, Waldorf .....Jan. 12
Hupp Motor Co., Dealer Luncheon, Commodore, 1 p.m...Jan. 12
NACC Banquet, Commodore, 6.30 p.m. .....Jan. 12
Olds Motor Company, Dealer Meeting, Waldorf, 10 a.m. ..Jan. 13
NACC Directors' Meeting, NACC offices, 10 a.m.....Jan. 13
De Soto Motor Co., Dealer Luncheon, Commodore, 12.30 noon Jan. 13
Hudson Motor Car Co., Dealer Luncheon, Commodore, 12.30 noon .....Jan. 13
Hupp Motor Co., Dealer Luncheon, Commodore, 1.00 p.m..Jan. 13
Chevrolet Motor Co., Banquet, Commodore, 6.30 p.m. ....Jan. 13
Motor & Equip. Assoc., Dinner, Astor, 6.30 p.m. .....Jan 13
Dodge Bros., Dealer Luncheon, Penna. Hotel, 12.30 noon..Jan. 14
Olds Motor Co., Dealer Meeting, Waldorf, 12.30 noon.....Jan. 14
Hudson Motor Co., Dealer Luncheon, Commodore, 12.30 noon Jan. 14
Merchants Assoc., Luncheon, Astor, 12.30 noon.....Jan. 14
Hupp Motor Car Co., Luncheon, Commodore, 1 p.m.....Jan. 14
Olds Motor Co., Dinner, Roosevelt, 6.30 p.m.....Jan. 14
Overseas Automotive Club, Dinner, Astor, 6.30 p.m.....Jan. 14
Society of Automotive Engineers, Dinner, Penna., 6.30 p.m. Jan. 14
Willys-Overland Co., Banquet, Commodore, 6.30 p.m.....Jan. 14

• GUNITE CAST BRAKE DRUMS ARE THE TIME-TESTED ANSWER TO THE INDUSTRY'S NEWEST PROBLEM

Gunite had the answer to the industry's newest problem nearly four years ago — but the problem did not become acute until the advent of free wheeling. Free wheeling brought the necessity of higher radial braking pressures — Gunite supplied the solution with drums cast from this pure, air furnace iron that's rigid and strong — tensile strength of 50,000 pounds per square inch resists deformation. Gunite cast brake drums wear evenly, stop cars swiftly, smoothly. This fact is proved by the thousands of Gunite-equipped trucks and buses now in service. One important brake manufacturer will not guarantee his braking mechanism unless Gunite cast brake drums are used. (Name on request.) Even though cast brake drums may not be under immediate consideration by your company, why not get the Gunite story now? Let our engineers give you the facts. The coupon below is for your convenience. Won't you send it now? There will be no obligation.

GUNITE

A PURE, AIR FURNACE, HIGH TENSILE IRON ADDS STRENGTH...ADDS WEAR...CUTS COST

THE PEARLITIC IRON

SEND US THE STORY

COUPON

THE GUNITE CORPORATION
ROCKFORD, ILLINOIS, U.S.A.

YES! We want to hear the Gunite story. Have your engineers write for an appointment at our mutual convenience.

Name_____ Company_____

Title_____ Address_____

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Advances in Urea Plastics

A new material for the automobile designer has been developed in the research laboratories of the Synthetic Plastics Co., a subsidiary of the American Cyanamid Co., and, after several months of restricted use, was recently put on the general market in the molding industry.

"Beetle 212," is a urea-formaldehyde plastic, embodying important improvements on the original Beetle molding powder, which appeared in America in 1928. A notable feature of this urea plastic is its availibility in bright translucent colors, including ivory and "china white." Such colors are made possible by the fact that the native color of the material is nearly white and is thus easily pigmented to any color desired, as compared with the familiar phenolic molding powders, whose natural color is amber against which even a heavy pigmentation is rather ineffectual.

The original Beetle powder was high priced and required a slow cycle in the molding press, with the result that moldings therefrom, while admittedly beautiful in color and luminosity, cost several times as much as black phenolic moldings. Three lines of automobiles in 1930 and 1931 were equipped with handles and other interior fittings made of this material in an ivory tone.

The improved "Beetle 212," however, has the same quick molding cycle as the phenolic compounds and can be introduced in a press that is running with the latter and produce, with little or no adjustment, white or bright colored moldings.

The price of the new material is midway between the top and the bottom prices named for the various phenolic colored powders, and the difference is so small that manufacturers now using blacks and browns can freely specify white or bright colors hereafter on any molding without seriously increasing the total cost.

Automatic Scale Prints Weights

Operating executives in the automotive industry will be interested in a recent announcement by the Toledo Scale Co., Toledo, Ohio, of the final perfection of a new automatic scale which prints the weights clearly and indelibly on an inserted ticket.

The operation of this new Printweigh Scale may be briefly described as follows:

A ticket large enough to accommodate 20 weight figures is inserted in a slot in the back of the round dial. When the weight is placed on the platform, the automatic indicator comes to rest according to common practice. This indication can be read by the operator from the back of the scale where he has inserted a ticket. When this indication stops at the correct weight, the operator touches a button which in 1/10th of a second prints the weight of the commodity on the ticket.

Taft-Peirce Angle Plate

A convenient method setting up angular work on the grinder, milling machine, shaper, drill press or jig borer is afforded by an Adjustable Angle Plate recently developed by the Taft-Peirce Mfg. Co., Woonsocket, R. I.

The fixture consists of a tilting table 8 in. x 10 in., hinged at one edge to a substantial base, rotatable on a subbase fitted with holding lugs and a bottom key for securing to the machine table. Approximate weight is 75 lb.

The rotating base is accurately graduated, which makes possible a convenient and quick set-up for machining compound angles. The tilting table can be set for ordinary purposes by the aid of a built-in protractor.

Abrasive Practice Stands

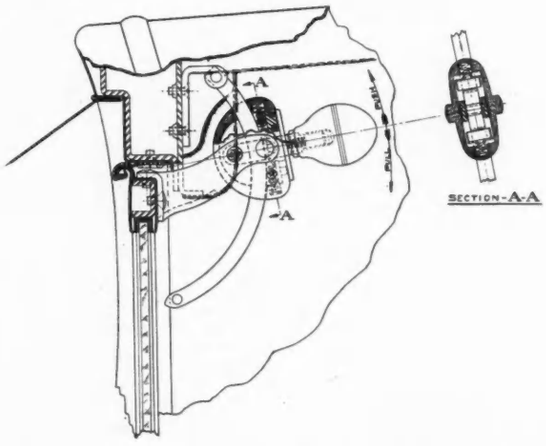
News release No. 545 of the division of simplified practice, Bureau of Standards, advises that recommendation R 118-30, has been reaffirmed for another year. This recommendation establishes allowable limits for the sizing of aluminum oxide and silicon-carbide abrasives for polishing and for grinding wheels.

Roller-Clutch Type Windshield Mechanism

A quick-operating mechanism that swings the windshield out to any desired angle has been developed by Motor Products Corp., Detroit, and a patent on it has been applied for. A single motion releases or locks the mechanism in either direction. The mechanism is operated with one hand and automatically locks the windshield securely in any position from closed to full open by merely releasing the handle.

The accompanying sketch illustrates the working principle of this invention. The housing encloses the roller-clutch mechanism, which engages a sector secured to the body header by a pivotal connection. The clutch rollers engage the adjacent face of this sector and on bearing blocks secured within the housing. Each clutch roller is normally urged in its clutching direction by a coil spring, and is selectively disengaged by means of a shiftable block that is actuated by a hand knob.

By moving this handle in either direction, one of the clutch rollers is moved against the action of its corresponding spring, releasing it from its clutching action so that the housing, and with it the windshield, is moved in the direction in which the handle is being moved. During this movement the other clutch roller moves out of its clutching position automatically. When the handle is brought to rest the springs act to move the rollers into clutching engagement, automatically locking in that position on the face of the sector.



(Turn to page 1012, please)

Amid Changing Gear Designs

The fundamentals of finishing Gears for Successful Operation are always:

METHOD
TOOLING
INSPECTION

The substitution of helical in place of spur gears in high speed gear sets has developed new and difficult problems in quiet gear production. Extreme accuracy in the case of helical gears is paramount if the best results are to be expected—and absolute control over tooth shape and helix angle is essential.

The Fellows Method provides the necessary control:

1. **By accurate cutters in which the minutest modifications in tooth shape can be constantly maintained.**
2. **Helix angles controlled by positive guides.**
3. **The finished product can be checked on an automatic machine, which eliminates the human element.**

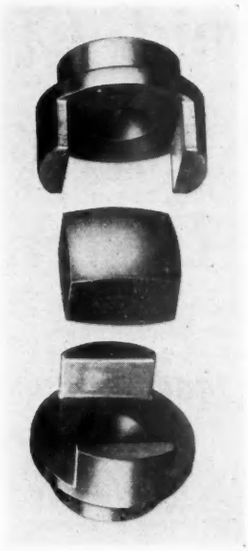
These methods assure the desired control up to the hardening fire. Control over the latter operation is possible by using a suitable grade of steel and temperature control. It is being done and Fellows Engineers will be glad to give you the facts. Write: THE FELLOWS GEAR SHAPER COMPANY, Head Office and Works, 78 River Street, Springfield, Vermont (616 Fisher Building, Detroit, Michigan).

Fellows Gear Finishing Methods were never more necessary than in the production of ultra-modern Gear Sets

FELLOWS
~ GEAR SHAPERS ~

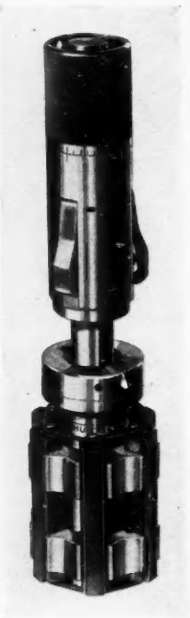
NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools



Hutto Automatic Drivehead

An automatic drivehead to be used in conjunction with the standard Hutto production hone has just been announced by Hutto Engineering Co., Inc., Detroit, Mich. It has been developed to provide faster stock removal, greater accuracy, maximum stone life, and higher quality of finish.



An important feature of the new drivehead is the automatic contraction and expansion of the grinder as it is withdrawn from and inserted into the bore of the work. One major setting of the micrometer adjustment is all that is required to grind all bores of the same diameters to equal limits. The only additional adjustment is to occasionally compensate for abrasive wear.

American Flexible Couplings

A recent addition to the line of flexible shaft couplings, manufactured by the American Flexible Coupling Co., Erie, includes two small sizes with maximum bores of ¾ in. and 1 in. and designated No. 4 and No. 6 respectively. In general design and kinematic action the small couplings are the same as the larger couplings manufactured by this company.

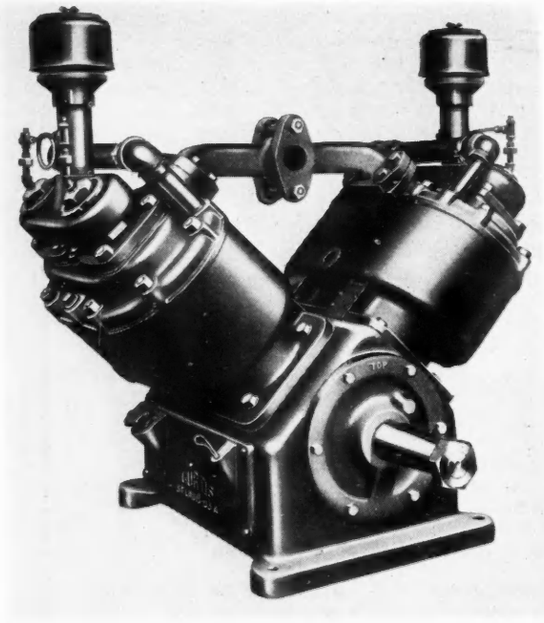
The flange sections of the small American couplings are die-cast. A wide groove is formed in the face, leaving two jaws between which the floating center member slides, as shown in the accompanying illustration. The floating center member is a solid, non-metallic, self-lubricating piece and transmits the torque between the flange sections. The design is simple and the coupling permits comparatively large misalignment between shafts, without the use of springs, bolts, pins or flexible materials.

The power capacity is 0.05 hp. per 100 r.p.m. for the No. 4, and 15 hp. per 100 r.p.m. for the No. 6. The weights are ¾ lb. and 2 lb. respectively. Both sizes permit a maximum parallel misalignment of 1/64 in. and a maximum angular misalignment of 1 degree.

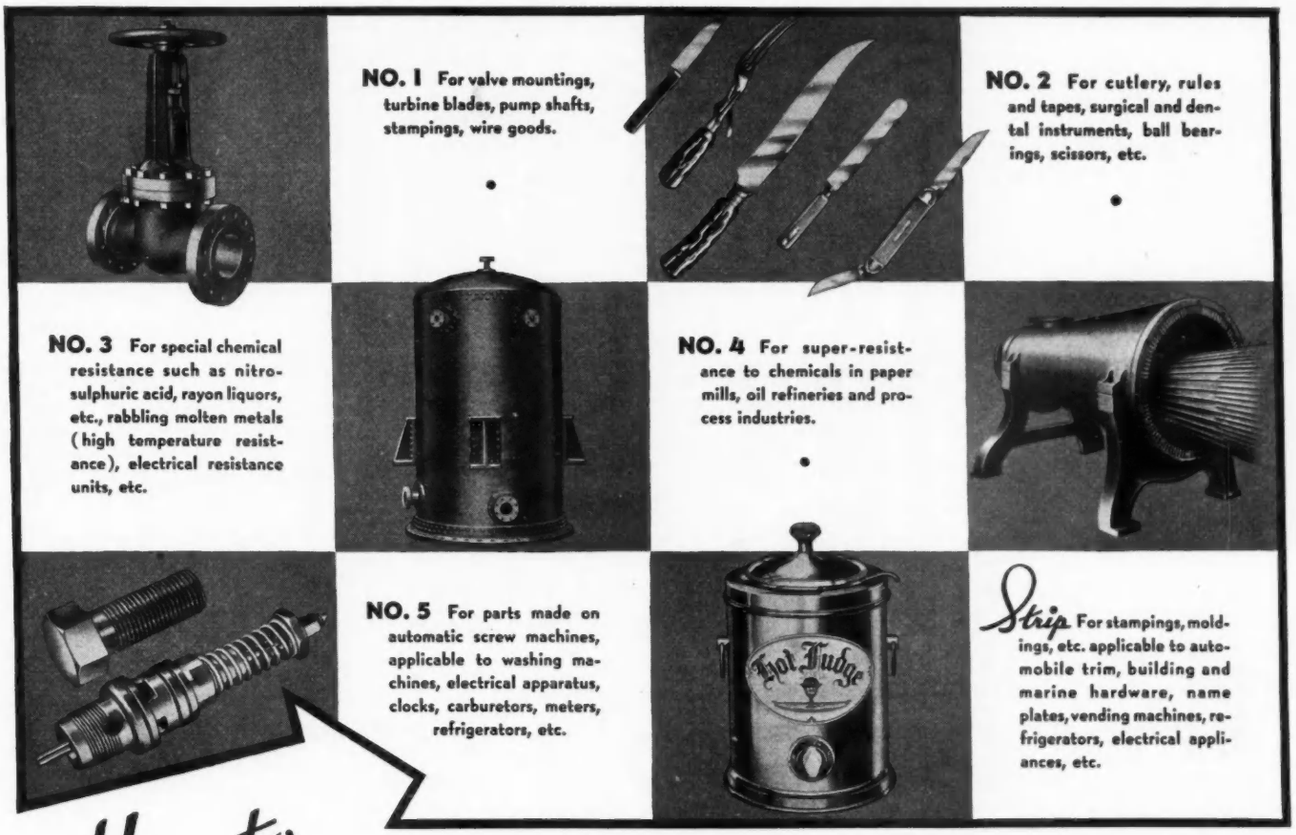
Curtis Industrial Compressors

The Curtis Pneumatic Machinery Co., St. Louis, Mo., has developed a new line of industrial compressors, known as Curtis Model "C" Timken Bearing Compressors. The complete line consists of 7 models, 5 of the two-cylinder type, ranging in size from 4¼ x 3¾ to 6½ x 5, with a displacement of 25 cu. ft. to 125 cu. ft. and two of the four-cylinder type, a 5½ x 5¼ and a 6½ x 5¼ size, with a displacement of 115 cu. ft. to 262 cu. ft. The compressors are designed principally for wide use in industrial and automotive plants. These compressors are available not only as stationary simple compressors for belt drive from a line shaft, separate motor, steam engine or other prime mover, but are also furnished as complete self-contained units, either direct connected or driven by Multiple "V" belt.

Outstanding features of these machines are, the carbon-free valves; the use of Timken bearings on the crankshaft; and the Curtis "centro-ring" oiling method.



Valves are of the light disk type, double heat-treated and made of rust-resisting metal. The small individual non-warping valves have single large non-obstructed ports and are carbon-free. The head design of the compressor has made possible the carbon-free feature. This is accomplished by delivering air into the cylinder at the lowest possible temperature and maintaining the piston and cylinder walls at a minimum temperature.


NO. 1 For valve mountings, turbine blades, pump shafts, stampings, wire goods.
NO. 2 For cutlery, rules and tapes, surgical and dental instruments, ball bearings, scissors, etc.
NO. 3 For special chemical resistance such as nitro-sulphuric acid, rayon liquors, etc., rabbling molten metals (high temperature resistance), electrical resistance units, etc.
NO. 4 For super-resistance to chemicals in paper mills, oil refineries and process industries.
NO. 5 For parts made on automatic screw machines, applicable to washing machines, electrical apparatus, clocks, carburetors, meters, refrigerators, etc.
Strip For stampings, moldings, etc. applicable to automobile trim, building and marine hardware, name plates, vending machines, refrigerators, electrical appliances, etc.
Hot Fudge

How to select the RIGHT stainless *for your job*

DO you need definite information about the stainless grade or type best suited to your product? How to fabricate it most efficiently and economically?

The Carpenter Steel Company has collected just the data that will help you—and it is available to you, with no strings attached!

For example, suppose you now manufacture—or contemplate making—stampings of stainless steel. You'll want the new Carpenter leaflet on stainless strip. It tells you what you need to know about the corrosion-resistance, color, temper, finish and other important qualities of the various grades of stainless strip. More than that, it gives you concrete working instructions about dies, presses, lubricants, as well as methods for annealing, pickling, polishing and buffing stainless strip.

Such information as this is also available on other Carpenter Stainless Steels for machining, forging, heat-treating, etc. Right now, while you are thinking of it, write us telling for what purpose the steel is to be used, and we will gladly send the data that applies to your particular problem.

THE CARPENTER STEEL COMPANY
Tool and Alloy Steels Exclusively
103 W. Bern Street Reading, Penna.

Carpenter STAINLESS STEEL

PRODUCTION PROFITS!

KIDDING? Gosh—no! There is such a thing as production profits . . . it's the difference between your cost today and what it would be if you'd use Elkaloy for your spot and lap seam welding. Try it and see!

Elkaloy is 40% harder than copper, and lasts 3 to 5 times as long without mushrooming . . . it does a better, cleaner job in less time, saves cost of frequent re-dressing and permits uniform operation without increasing amperage.

It's easy to switch to Elkaloy. No new machines necessary—no new technical problems. Wherever you use copper now you can change to Elkaloy and save money. Write today for complete technical data on Elkaloy and Elkonite—the modern resistance welding electrodes.

ELKON DIVISION OF
P. R. MALLORY & CO., Inc., Indianapolis, Ind.
Sales Offices: New York and Detroit

ELKONITE — ELKALOY

MALARC

ELKON GUARANTEES LOWER WELDING COSTS

EXPECT *great* THINGS OF THESE BRAKES

Reflecting the achievement of more than a half century's research, development and manufacture, Bendix-Westinghouse Automotive Air Brakes are easily today's most dependable control. Swift, heavy-duty highway transportation everywhere has learned to rely on the smooth, powerful, instant action of these super brakes . . . and not without reason ★ The combined resources of two great companies, pioneers in the braking field and the skilled hands of craftsmen, born of several generations of brake builders, are potent factors in the present success and future greatness of this recognized world standard of braking safety ★ That's why we say, *expect great things of these brakes* of which we ourselves are pardonably proud ★ THE BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Pennsylvania.

6299

★ BENDIX ★

WESTINGHOUSE

AUTOMOTIVE AIR BRAKES

. . A BRAKING *that keeps pace* . . . OFFERED BY

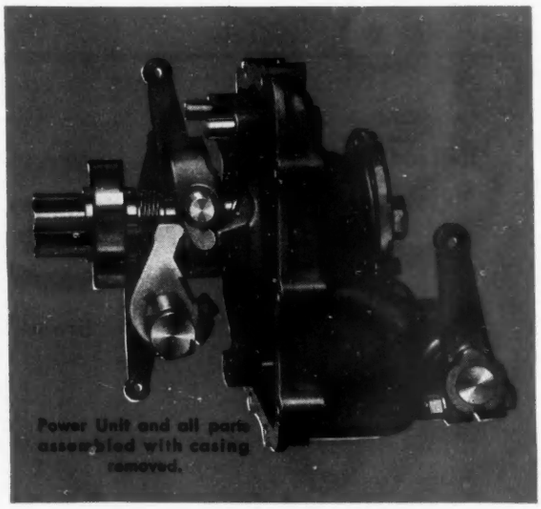
Free Wheeling Demonstrates the Sensational Advantages Stewart-Warner's 4-Wheel Power Brake System Offers to Keep Pace with Today's Traffic Problems

It is no more a reflection on free wheeling, to say that it is a development that revealed the necessity for better brake protection, than it is to say that balloon tires pointed out the necessity of modifying wheel and steering equipment.

Free wheeling, by dispensing with engine friction and pumping action as a force in deceleration, simply focuses attention on the need for developing brakes to take care of a greater responsibility.

The Stewart-Warner 4-Wheel Power Brake System compensates for this loss of engine braking effect. It offers a big advantage in free wheeling not possible to obtain with other brakes. For the power for deceleration is not dependent in any way upon the running of the engine, as it is derived directly from the traction of the car wheels. When the brakes are applied, a load is put upon the propeller shaft, which has a retarding effect on the wheels comparable to braking with the clutch in. This is very desirable at high speeds, since there is a uniform retarding effect through the differential gearing to the rear wheels when brakes are applied.

This action is an inherent characteristic of the operation of the power unit, and is equally effective whether used with free wheeling or not—or with the engine clutch in or out.



Power Unit and all parts assembled with casing removed.

An advantage of this design is that all parts of the power unit and free wheeling mechanism can be installed completely assembled in one housing—and easily attached in the final assembly of the transmission. All this may be accomplished without disturbing present transmission case design.

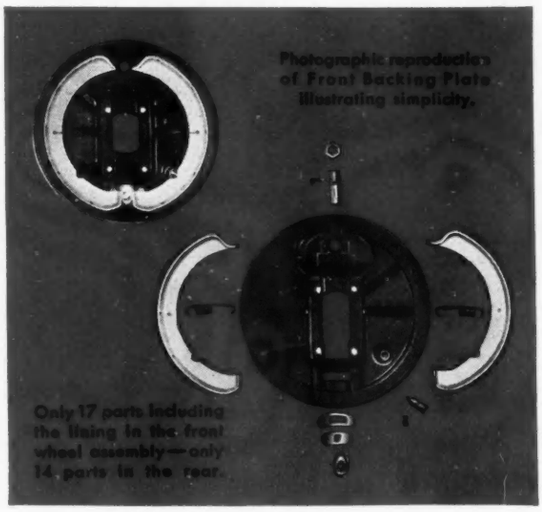
STEWART-WARNER

NOW READY . . . SEE DEMONSTRATING EXHIBITS

ACHIEVEMENT *with free wheeling* STEWART-WARNER

Safer, more economical, more comfortable Braking for Cars, Motor Coaches, and Trucks of all types

Lessens driver's fatigue, for a power six times the motor power used to accelerate to a given speed is always at the command of the driver without muscular effort. The amplification mechanism applies braking power in direct proportion to pedal pressure. It is always under driver's control as there is no abnormal energizing action of wheels.


Photographic reproduction of Front Backing Plate illustrating simplicity.
Only 17 parts including the lining in the front wheel assembly—only 14 parts in the rear.

Car owners, Motor Coach and Truck Operators will be interested in the low maintenance costs of these brakes. In many tests, 10,000 to 20,000 miles have been run up before adjustments were necessary. Adjustment requires no brake-testing machine—only a wrench and a screw driver. Uniform distribution of braking power and wear is assured by unique design and construction. No additional booster devices are required with these brakes, even on the largest motor coach or truck.

Wheel Brakes Offer Unusual Advantages for Pedal Operated Installations

Their simplicity, direct positive linkage and improved design assure a uniform distribution of braking force and an accuracy of modulation heretofore unobtainable.

The unusual design and construction of the one-piece forged shoe assures equal pressure and prevents scoring.

Hand or Emergency Brake

The Hand Brake of the Stewart-Warner System pulls directly on rear brakes, and also simultaneously on the front brakes through brake distribution lever. It may be applied independently of service or foot brake, and is always available should any part of the system fail. A unique Booster link—or automatic slack take-up—provides reserve even after foot brake becomes inoperative through excessive wear.

For complete details of construction and demonstration of the operation of Stewart-Warner's Braking System, call or write our Engineering Department. It is at your service.

STEWART-WARNER CORPORATION
Chicago, U. S. A.

BRAKE SYSTEMS

AT NEW YORK AND CHICAGO AUTO SHOW

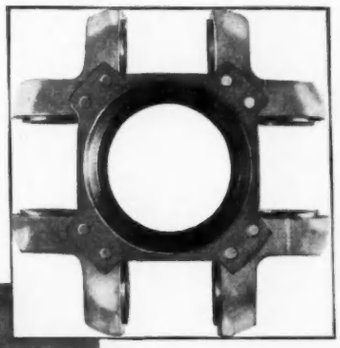
A dependable guide to car sales

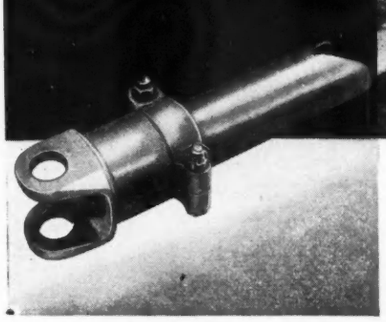
Standing out above the clamor of style, "Timken Bearing Equipped" is a dependable guide to car sales because it is a guide to dependable car performance—and has been for 33 years—and the majority of motorists know it . . . Make it your guide to quicker, easier sales closing. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**

The AUTOGIRO

© 1931, Autogiro Co. of America





ABOVE: Nickel-Chromium Steel rotor hub of Autogiro, mfd. by AUTOGIRO SPECIALTIES CO., Philadelphia, Pa. LOWER LEFT: Nickel Alloy Steel spar end fitting used in Autogiro. (Forgings by The Midvale Company). LEFT: Autogiro mfd. by PITCAIRN AIRCRAFT, INC., Willow Grove, Pa.

...*with* NICKEL STEEL

parts introduces a new era of air travel

Marking a new development in aircraft design, the Autogiro embodies distinctive safety features which promise to revolutionize aeronautical construction. One of the most important parts of the Autogiro is the rotor with its horizontal revolving blades—a unique feature permitting the machine to hover almost stationary and to decend almost vertically.

Nickel Alloy Steel S.A.E. 3435 is specified by the Autogiro Specialties Company for the rotor hub and fittings. This hub must be especially strong and tough, since in flight it must withstand the centrifugal and torsional forces incident to the rotation of the blades, and must support the entire weight of the machine. Nickel Alloy Steels are also used in most of the highly stressed parts of the engine which powers the Autogiro, and Aerol landing gear struts with Nickel Steel cylinders are standard equipment.

Leading aviation engineers specify Nickel Alloy Steel wherever toughness, safety and dependability are essential. You are invited to consult with us regarding your problems in selecting Nickel Alloy Steels.

Nickel
ALLOY STEEL
PERFORMS BETTER LONGER

INCO NICKEL

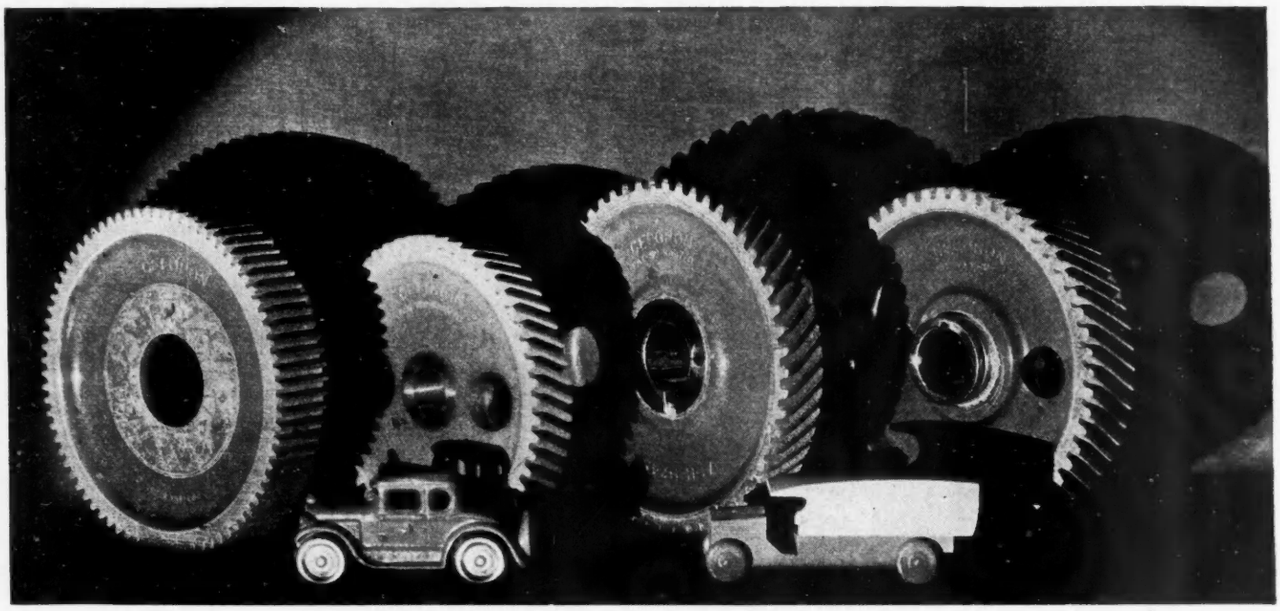
Send for our publication, "The Curtiss and Wright Engines and Their Use of Nickel Alloy Steel"

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y.

Miners, refiners and rollers of Nickel. Sole producers of Monel Metal

THE CONQUEST FOR SILENCE MOVES ON

BODY NOISES SILENCED BY ANTI-SQUEAK MATERIALS BETWEEN BODY AND FRAME



THE TIMING DRIVE PERMANENTLY SILENCED BY

CELORON

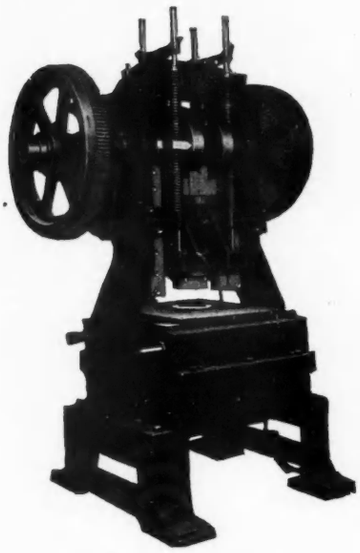
SILENT TIMING GEARS

CONTINENTAL-DIAMOND FIBRE COMPANY

NEWARK DELAWARE

BLISS

Don't Trim and Grind TRIM FLAT



BLISS FLAT EDGE TRIMMERS

To trim quickly and accurately a simple straight edge or an irregularly notched edge, to do this in a single operation, and to accomplish it with dies which are simple in principle, has proven practical, easy and highly economical, in Bliss Flat Edge Trimmers.

A punch on the press slide enters the article to be trimmed and is held accurately in position with reference to the cutting edge of the outer die in which the article is set. A floating pad on the punch determines accurately the height to which the article will be trimmed. In operation the article is placed in the die, the punch descends locating the inner and outer cutting edges, and a slight front and back, right and left motion is imparted to the die which is carried in compound slides in the bed of the press. There results a level and square sheared edge without joint marks or deformation.

"Bliss" on your machinery is more than a name; it's a guarantee.

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Sales Offices: Detroit Cleveland Chicago Boston Philadelphia Dayton New Haven Rochester

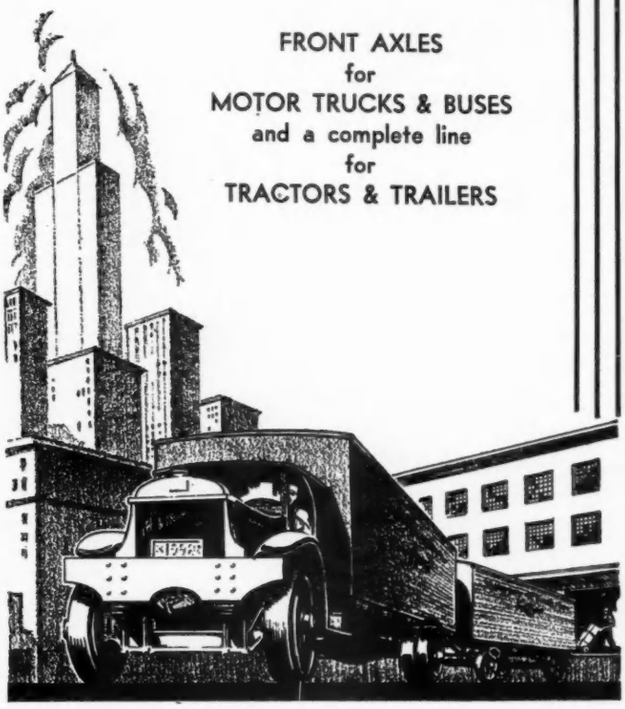
Foreign Factories and Offices: London, Eng. Turin, Italy Paris, France

SHULER FRONT AXLES

GREETINGS

To all our friends in the automotive industry, we extend our heartiest greetings with the hope that the dawn of a New Year will find all in excellent shape for better things in 1932.

FRONT AXLES
for
MOTOR TRUCKS & BUSES
and a complete line
for
TRACTORS & TRAILERS



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Heavy, medium and light stampings in any quantity. A steady flow of production—*when* you want it.

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BUDD SNAPSPOKES
make dull wheels bright
BUDD WHEEL CO., DETROIT, MICH.

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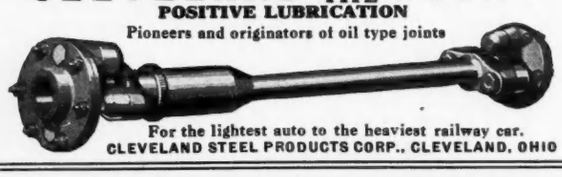
CHAMBERSBURG ENGINEERING CO.
CHAMBERSBURG, PA.
THE NATIONAL MACHINERY CO.
TIFFIN, OHIO
Sales Offices
NEW YORK, 152 W. 42nd St. CHICAGO, 565 W. Washington St.
DETROIT, 2457 Woodward Ave.

CLEVELAND OIL TYPE JOINT
POSITIVE LUBRICATION
Pioneers and originators of oil type joints



For the lightest auto to the heaviest railway car.
CLEVELAND STEEL PRODUCTS CORP., CLEVELAND, OHIO

Pioneers in Better Drilling Methods
FOOTBURT
Single and multiple spindle special drilling, boring, reaming, tapping machine and FOOTBURT Sipp Sensitive Drilling Machines
THE FOOTE-BURT COMPANY CLEVELAND, OHIO

Wyandotte
CLEANS CHEMICALLY CLEAN
METAL CLEANERS
ASK YOUR SUPPLY MAN
Retain their cleaning strength, giving longer service

AJAX
HOT METAL WORKING MACHINES
THE AJAX MANUFACTURING COMPANY
621 Marquette Bldg. 140 So. Dearborn St. Chicago, Ill.
Euclid Branch P. O. Cleveland, Ohio
1869 Hudson Terminal 50 Church St. New York City

BUYERS' GUIDE

Automotive Products and Factory Equipment Manufactured by Advertisers in This Issue

See Alphabetical List of Advertisers on Pages 62 and 63

This Advertiser's Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Acids
Sulphuric
New Jersey Zinc Co.

Air Cleaners
Handy Governor Corp.
United Air Cleaner Corp.

Alloys
Ferro
International Nickel Co.
New Jersey Zinc Co.
Non-Ferrous
International Nickel Co.
New Jersey Zinc Co.

Ammeters
General Electric Co.

Arms & Knuckles, Steering
Canton Forge & Axle Co.

Axles
Canton Forge & Axle Co.
Park Drop Forge Co.
Shuler Axle Co., Inc.

Bearings, Anti-Friction
Ball
Aetna Ball Bearing Mfg. Co.
New Departure Mfg. Co.
Standard Steel & Bearings, Inc.
Roller
Timken Roller Bearing Co.

Bending & Straightening Machines
Chambersburg Engineering Co.
Chambersburg National Co.
Cleveland Punch & Shear Works Co.
National Machinery Co.

Blanks
Stamped
Konigslow Mfg. Co., Otto

Bodies
Budd Mfg. Co., E. G.
Mullins Mfg. Corp.

Bolts & Nuts
Russell, Burdsall & Ward Bolt & Nut Co.

Boring Machines
Foote-Burt Co.
Rockford Drilling Machine Co.

Brake Bands
Konigslow Mfg. Co., Otto

Brake Boosters
Stewart-Warner Corp.

Brake Drums
Erie Malleable Iron Co.
Gunite Corp.

Brakes
Air
Bendix - Westinghouse Automotive Air Brake Co.
Mechanical
American Cable Co.
Bendix Brake Co.
Eclipse Machine Co.
Stewart-Warner Corp.

Brass Specialties
Dole Valve Co.

Bulldozers
Ajax Mfg. Co.

Bumpers
Stewart-Warner Corp.

Bushings
Fibre
Continental - Diamond Fibre Co.

Camshafts
Park Drop Forge Co.

Carburetors
Marvel Carburetor Co.

Castings
Die
Barnhart Bros. & Spindler
Paragon Die Casting Co.
Malleable
Erie Malleable Iron Co.
Link-Belt Co.
Timken Roller Bearing Co.
Steel
Link-Belt Co.

Chains
Front End
Link-Belt Co.

Channels for Glass
Felt
American Felt Co.

Chucks, Magnetic
Heald Machine Co.

Cleaners, Metal
American Chemical Paint Co. (Rust Preventive)
Ford Co., J. B.

Clutches
Rockford Drilling Machine Co.

Compressors, Air
Bendix - Westinghouse Automotive Air Brake Co.

Connecting Rods
Canton Forge & Axle Co.
Park Drop Forge Co.
Wyman-Gordon

Contact Points, Electrical
Elkon Div. of P. R. Mallory & Co., Inc.

Conveyor Equipment
Link-Belt Co.

Couplings
Pipe & Tubing
Dole Valve Co.

Covers, Housing
Acklin Stamping Co.

Cranes
Portable
Canton Foundry & Machine Co.

Crankshafts
Canton Forge & Axle Co.
Park Drop Forge Co.
Wyman-Gordon

Cups
Lubricating
Gits Bros. Mfg. Co.
Link-Belt Co.

Cutters
Brown & Sharpe Mfg. Co.
Fellows Gear Shaper Co. (Gear)

Die Cushions
Marquette Tool & Mfg. Co.

Dies, Jigs & Fixtures
Marquette Tool & Mfg. Co.

Disks, Clutch
Acklin Stamping Co.

Drilling Machines
Foote-Burt Co.
Rockford Drilling Machine Co.
Superior Machine Tool Co.
Multiple Spindle
Greenlee Bros. & Co.

Enamels
American Chemical Paint Co. (Rust Proofing)
Bakelite Corp.

(Continued on page 58)

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Get $3.00 to $5.00 More Per Ton

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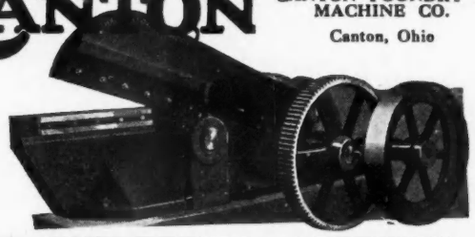
CANTON

CANTON FOUNDRY & MACHINE CO.
Canton, Ohio



700 Styles and Sizes

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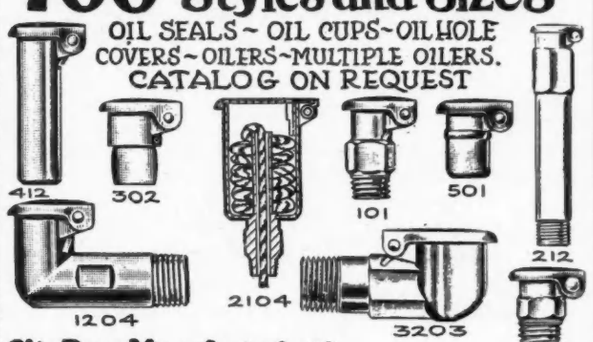

Gits Bros. Manufacturing Co.
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Cut Your Costs

By the use of Die Cast Parts

Illustrated here are only a few castings where substantial savings have been effected, due to partial, and in some cases, total elimination of costly machining operations. Castings made from Aluminum, Zinc, Lead and Tin Base metals, alloyed to suit your particular requirements.

Send Blue Prints or Samples for Quotations

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Monroe and Throop Streets, Chicago

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SMALL STAMPINGS

WASHERS and SPRING COTTERS

WIRE SHAPES

M. D. HUBBARD SPRING CO.

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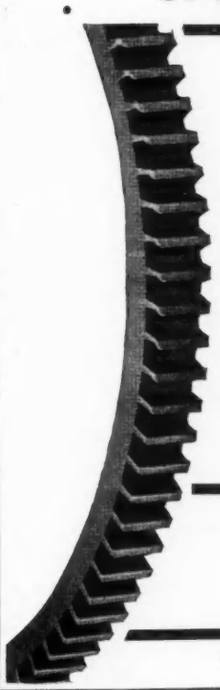
SPECIAL NOTICE
TO AMERICAN MANUFACTURERS

If you are interested in the manufacture of your products in Great Britain, a well-known British firm, a subsidiary company of Imperial Chemical Industries, Ltd., London, possessing an extensive and modern plant, engaged in the manufacture on mass production lines of Carburetors and other Motor Accessories, is prepared to submit tenders for the manufacture of precision engineering parts or complete assemblies of any description in steel or non-ferrous metals.

All enquiries should be addressed to:

AMAL LIMITED
Holford Works, Perry Barr, Birmingham, England

MADE TO YOUR SPECIFICATIONS



Tell us your exact requirements. Whatever they are, our experience will enable us to meet them. Excelsior gears are rolled from your specification steel — and electrically butt welded under hydraulic pressure.

You control the finished product as closely as though it were made in your own shops.

We have an interesting cost-saving story on Excelsior Flywheel Starter Gears. May we tell it to you?

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Springfield, Ohio

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AUTOMOTIVE DIE CASTINGS
QUALITY PARAGON CAST DIE CASTINGS
ALUMINUM—ZINC—TIN and LEAD BASE
PARAGON DIE CASTING CO.
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DUST SHIELDS — HOODS
RUNNING BOARD SHIELDS — RADIATOR SHIELDS
BODY STAMPINGS
MOTORS METAL MFG. CO.
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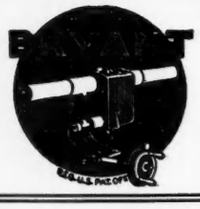
Welding is Faster
Welding—ELECTRIC Welding—is the fastest, most reliable method of joining metal. In case you are not finding it so, get in touch with us. Standard machines of all types and special designs where the work requires them.
The Federal Machine & Welder Co.
Branches in twelve cities WARREN, O.

ROCKFORD HIGH-PRODUCTION, MULTI-SPINDLE
DRILLING, BORING, TAPPING MACHINES
Vertical and Horizontal, Multiple-Way Types.
Submit your Problem.
ROCKFORD DRILLING MACHINE COMPANY
11 Catherine St., Rockford, Illinois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Single Slide Type
¼" holes to 40" O.D.
BRYANT CHUCKING GRINDER CO.
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WASHERS
EXCELSIOR LEATHER WASHER MFG. CO.
Rockford, Illinois

Greenlee
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Automatic Screw Machines. Special Machinery.

DeVilbiss
Spray- PAINTING FINISHING *System*
THE DEVILBISS COMPANY TOLEDO, OHIO

BUYERS' GUIDE—Continued

(Continued from page 56)

Engines
Continental Motors Corp.

Felt
American Felt Co.

Fenders
Motors Metal Corp.
Mullins Mfg. Corp.

Fibre Rods, Sheets, Tubes
Continental - Diamond Fibre Co.

Filters
Oil
Handy Governor Corp.

Floor Boards, Wood
Mengel Co.

Forgings
Canton Forge & Axle Co.
Park Drop Forge Co.
Pittsburgh Forgings Co.
Wyman-Gordon

Furnaces, Electric
(Annealing, Carburizing, Heat Treating, Forging and Welding)
Electric Furnace Co.
Surface Combustion Corp.

Gaskets
Cork
Armstrong Cork Co.
Felt
American Felt Co.

Gear Cutting Machines
Brown & Sharpe Mfg. Co.
Fellows Gear Shaper Co. (Shapers)

Gear Material
Non-Metallic
Bakelite Corp.
Continental - Diamond Fibre Co.

Gears
Flywheel Ring
Springfield Mfg. Co.
Timing, Metallic
Canton Forge & Axle Co.
Link-Belt Co.
Park Drop Forge Co.
Timing, Non-Metallic
Continental - Diamond Fibre Co.
General Electric Co.

Governors, Engine
Handy Governor Corp.

Grinders
LeBlond Machine Tool Co., R. K.

Grinding Machines
Brown & Sharpe Mfg. Co.
Bryant Chucking Grinder Co.
Fellows Gear Shaper Co.
Foote-Burt Co.
Heald Machine Co.
Landis Tool Co.
LeBlond Machine Tool Co., R. K.
Internal
Bryant Chucking Grinder Co.
Heald Machine Co.
Surface
Bryant Chucking Grinder Co.
Heald Machine Co.
Tool
LeBlond Machine Tool Co., R. K.
Universal
Landis Tool Co.
Valve Seat
Foote-Burt Co.

Hammers
Power
Chambersburg Engineering Co.
Chambersburg National Co.
Erie Foundry Co.
National Machinery Co.

Hangers
Shafting
New Departure Mfg. Co.

Hardware, Body
Mitchell Specialty Co. (Dovetails)

Heaters, Car
Mitchell Specialty Co.
Stewart-Warner Corp.

Hobs
Brown & Sharpe Mfg. Co.

Hoists, Portable
Canton Foundry & Machine Co.

Hoods
Motors Metal Corp.

Hose, Flexible Metallic
(Radiator and Fuel Lines)
Titeflex Metal Hose Co.

Insulating Material
Bakelite Corp.
Continental - Diamond Fibre Co.

Lathes
Automatic Chucking
LeBlond Machine Tool Co., R. K.
Potter & Johnston Machine Tool Co.
Crankshaft Turning
LeBlond Machine Tool Co., R. K.
Turret
Potter & Johnston Machine Tool Co.

Lighting Equipment, Electric
Factory
General Electric Co.
Vehicle
Mitchell Specialty Co. (Flash & Stop Lights)

Locks
Ignition
Chicago Lock Co.
Mitchell Specialty Co.

Lubricators
Chassis
Gits Bros. Mfg. Co.

Lugs
Wolverine Tube Co.

Lumber, Dimensions
Mengel Co.

Machine Work
Jackson Auto Radiator Co.
Konigslow Mfg. Co., Otto (General)

Milling Machines
Brown & Sharpe Mfg. Co.
LeBlond Machine Tool Co., R. K.
Rockford Drilling Machine Co.
Universal
LeBlond Machine Tool Co., R. K.

Molded or Machined Parts (Phenolic)
Bakelite Corp.
Continental - Diamond Fibre Co.

Motors, Electric Power
General Electric Co.

Nickel
International Nickel Co.

Pads
Felt
American Felt Co.

Paints
Heat Resisting
American Chemical Paint Co.

Parts, Wood Body
Mengel Co.

Pickling Compounds
American Chemical Paint Co.

Plugs
Expansion
Hubbard Spring Co., M. D.

Powerplants, Industrial
General Electric Co.

Presses
Bliss Co., E. W.
Chambersburg Engineering Co.
Chambersburg National Co.
Cleveland Punch & Shear Works Co.
Erie Foundry Co.
Ferracute Machine Co.
Marquette Tool & Mfg. Co.
National Machinery Co.

Primers, Gasoline
Dole Valve Co.

Pumps
Lubricating
Cleveland Steel Products Corp.

Punches
Cleveland Punch & Shear Works Co.
Ferracute Machine Co.

Radiator Parts
Jackson Auto Radiator Co.

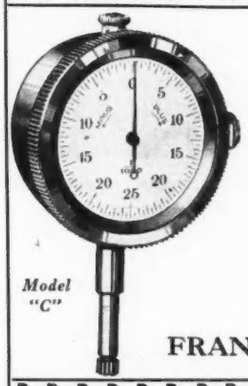
Radiator Shells
Motors Metal Corp.

Radiators
Jackson Auto Radiator Co.

Removers, Enamel and Paint
American Chemical Paint Co.

Rings & Bands, Welded
Akron-Selle Co.

(Continued on page 60)



RANDALL AND STICKNEY

After 1,456,960 revolutions on a testing machine, the gears in Model "C" Indicator showed no sign of wear. Case is a brass casting. Case unit and plate unit are separate, making repairs simpler. See our catalog.

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PJ FOR OVER A QUARTER OF A CENTURY PJ

THE PIONEER MANUFACTURER OF AUTOMATIC CHUCKING EQUIPMENT

POTTER & JOHNSTON MACH. CO.

PAWTUCKET, R. I., U. S. A.

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for the Automobile Industry

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( ) Steam Drop Hammers ( ) Board Drop Hammers

( ) Single and Double Frame Forging Hammers

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Erie, Pa. 400

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EMPIRE
Factories at PORT CHESTER, N. Y. ROCK FALLS, ILL. CORAOPOLIS, PA.
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Detroit, Seattle, Portland, Los Angeles

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THE UNITED AIR CLEANER
United Air Cleaners prevent harmful dust and dirt from reaching the motor—insuring long life and smooth performance
Automatic protection at lowest cost! Long used as standard equipment by Lincoln, Chrysler, Dodge and Franklin, etc.
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PEROLINE— Rust Preventing Oil
KEMICK— Manifold Paint
FLOSOL— Soldering Flux
PARADOX— Rust Proofing Enamel
AMERICAN CHEMICAL PAINT CO.
AMBLER, PENNA.

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IS INEVITABLE
More and more are Automotive Engineers striving to make their product 100 per cent oil lubricated.
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MECHANICS UNIVERSAL JOINT CO., Rockford, Ill.
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QUALITY SERVICE WORKMANSHIP
DETROIT OFFICE GEN'L MOTORS BLDG.
CARBON & ALLOY DROP OR UPSET FORGINGS

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THE CLEVELAND AUTOMATIC MACHINE CO.
CLEVELAND, O.
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Standard for many Automotive Parts. In Laminated Sheets, Rods and Tubes, Cements, Varnishes, Lacquers and Enamels
BAKELITE CORPORATION
247 Park Avenue, New York, N. Y.
Chicago Office: 635 West 22nd Street

BUYERS' GUIDE—Continued

(Continued from page 58)

Rivets
Russell, Burdsall & Ward Bolt & Nut Co.

Rolling Mills
Bliss Co., E. W.

Running Boards
Metal
Motors Metal Corp.
Wood
Mengel Co.

Rust Removers & Preventives
American Chemical Paint Co.

Saws
Ajax Mfg. Co. (Hot Cutting)

Screw Machines
Brown & Sharpe Mfg. Co.
Cleveland Automatic Machine Co.
Greenlee Bros. & Co.
Potter & Johnston Machine Tool Co.

Shafting
Bliss & Laughlin, Inc. (Turned & Polished)
New Departure Mfg. Co.

Shafts, Axle, Propeller & Transmission
Cleveland Steel Products Corp.
Pittsburgh Steel Prods. Co.

Shears
Bliss Co., E. W.
Canton Foundry & Machine Co.
Cleveland Punch & Shear Works Co.
Ferracute Machine Co.

Sheet Metal Machines
Bliss Co., E. W.
Cleveland Punch & Shear Works Co.
Ferracute Machine Co.

Shock Absorbers
Stewart-Warner Corp.

Special Machinery
Bliss Co., E. W.
Cleveland Automatic Machine Co.
Greenlee Bros. & Co.

Speedometers & Tachometers
Stewart-Warner Corp.

Spray Painting & Lacquering Equipment
DeVilbiss Co.

Springs
Flat & Spiral
Hubbard Spring Co., M. D.
Leaf
Mather Spring Co.

Sprockets
Link-Belt Co.

Stampings
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Akron-Selle Co.
Hubbard Spring Co., M. D.
Jackson Auto Radiator Co.
Konigslow Mfg. Co., Otto
Mitchell Specialty Co.
Motors Metal Corp.
Mullins Mfg. Corp.
Worcester Stamped Metal Co.

Starter Drives
Bendix Brake Co.
Eclipse Machine Co.

Steel
Alloy
Carpenter Steel Co.
Firth-Sterling Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Timken Roller Bear. Co.
Bars
Carpenter Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Timken Roller Bear. Co.
Billets
Carpenter Steel Co.
Illinois Steel Co.
Timken Roller Bear. Co.
Carbon
Carpenter Steel Co.
Firth-Sterling Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Timken Roller Bear. Co.
Cold Drawn
Bliss & Laughlin, Inc.
Carpenter Steel Co.
Republic Steel Corp.
Electric Furnace
Carpenter Steel Co.
Timken Roller Bear. Co.
High Speed
Carpenter Steel Co.
Firth-Sterling Steel Co.
Shapes
Illinois Steel Co.
Sheets
Eastern Rolling Mill Co.
Stainless
Carpenter Steel Co.
Firth-Sterling Steel Co.
Republic Steel Corp.
Strip
Carpenter Steel Co.
Republic Steel Corp.
Tool
Carpenter Steel Co.
Firth-Sterling Steel Co.
Timken Roller Bear. Co.

Steering Wheels
Acklin Stamping Co.

Tank Support Straps
Konigslow Mfg. Co., Otto

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Greenlee Bros. & Co.
Superior Machine Tool Co.

Thermostats
Dole Valve Co.

Thread Generators
Fellows Gear Shaper Co.

Tools, Small
Brown & Sharpe Mfg. Co.

Tubes, Axle Steering Column & Torque
Pittsburgh Steel Prods. Co.

Tubing
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Wolverine Tube Co.
Brass & Copper
Wolverine Tube Co.
Flexible Metal
Titeflex Metal Hose Co.
Steel
Pittsburgh Steel Prods. Co.

Turntables, Industrial & Automobile
Canton Foundry & Machine Co.

Turret Machines, Automatic
Potter & Johnston Machine Tool Co.

Universal Joints
Cleveland Steel Products Corp.
Mechanics Universal Joint Co.

Upsetting Machines
Ajax Mfg. Co.

Vacuum Tanks
Stewart-Warner Corp.

Varnishes
Bakelite Corp.

Washers
Felt
American Felt Co.
Excelsior Leather Washer Mfg. Co.
Fibre
Excelsior Leather Washer Mfg. Co.
Miscellaneous
Excelsior Leather Washer Mfg. Co. (Composition, Leather, Paper)
Plain Metal
Acklin Stamping Co.
Hubbard Spring Co., M. D.
Konigslow Mfg. Co., Otto

Welders
Electric
Federal Mach. & Welder Co.
General Electric Co.

Welding Material
Elkon Div., P. R. Mallory & Co., Inc. (Dies for arc and resistance welding)

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Budd Wheel Co.
Erie Malleable Iron Co.

Wicks, Felt
American Felt Co.

Zinc Sheets, Slabs, Sticks Strips, Etc.
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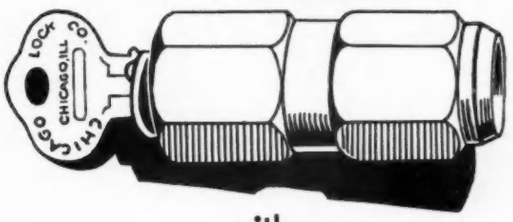

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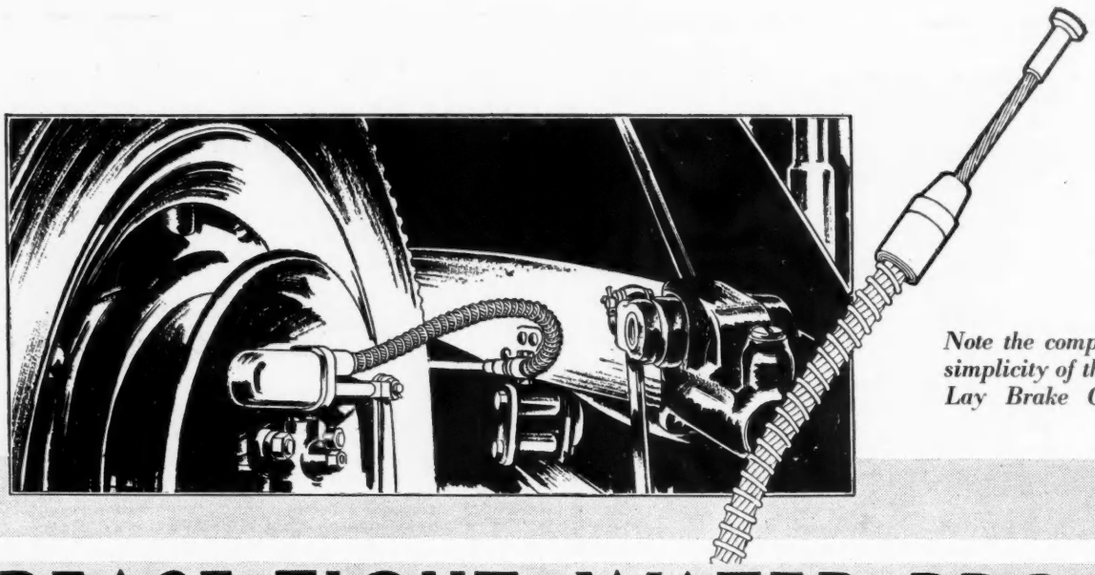

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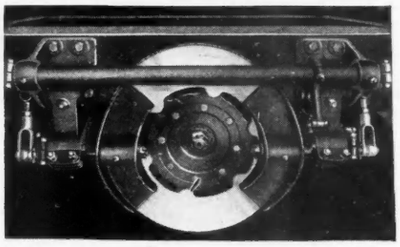

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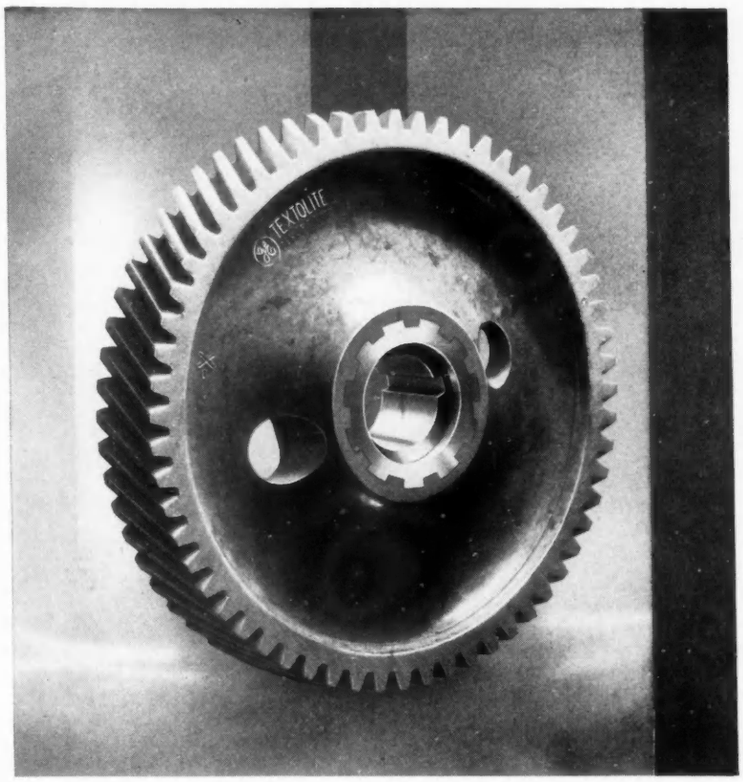

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